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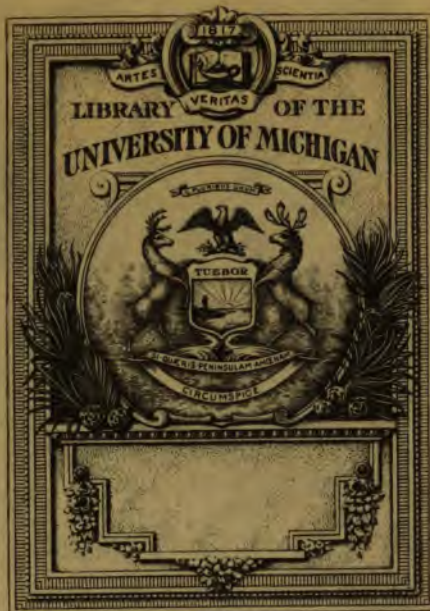
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Soviet Union. Esthetics of motion



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IRVING KANE POND
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The
ESTHETICS OF MOTION

WITH SPECIAL REFERENCE TO THE

Psychology of Grace

INCLUDING A TRANSLATION OF CHAP. I, PART III, OF
SOURIAU'S L'ESTHETIQUE DU MOUVEMENT
WITH OCCASIONAL COMMENT BY

George H. Browne

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THE ESTHETICS OF MOTION

WITH SPECIAL REFERENCE TO

THE PSYCHOLOGY OF GRACE

A Translation of Chapter I of Part III of Souriau's *L'Esthétique du Mouvement* with Occasional Comment.

I am frequently called upon to serve on the board of judges at American and Canadian figure-skating competitions. The present regulations of the International Skating Union compel judges to allot a certain proportion of the marks to the grace of the contestants. Now, on matters of technique—such as accuracy and control of edge, size and placing of figures, difficulty, variety, and composition of program, rhythm and time in execution (unison and harmony, of pairs), etc.,—the accepted international standards of today render not difficult reasonably consistent apportionment of marks by judges who are competent and impartial; but grace, tho' easily recognized, has been the most difficult of all artistic elements to analyze and differentiate numerically. To discover principles and criterions of judgement here, I have of late taken pains to consult the experimental and physiological psychologists, on one hand, and the most expert performers in different branches of physical self-expression, on the other,—withal pursuing, at times, the literature of the subject—not wholly without results.

In the philosophical library at Harvard, last spring, I stumbled upon an interesting book on the esthetics of motion that nobody in the psychological department had apparently ever read, tho' written nearly thirty years ago—perhaps just because written thirty years ago! American skaters might well suspect the competency of the author, who confessed that he "had never seen skating on one foot, and understood that the feat was thought to be impossible"—and that, twenty five years after an American skater, in disgust at the excess of mere difficult acrobatics on one foot in the skating of his day, had taken his more artistic style to Europe—now become the International style—and that, too, only the year before the organization of the International Skating Union, which included among the six fundamental figures in its prescribed schedule the serpentine *on one foot*! Yet the clever

French psychologist proceeded to prove, according to his method, that skating on one foot was possible: "It would amount to a series of jumps sidewise, linked together by a continuous glide. The difficulty would be not to acquire momentum but, once acquired, to regain equilibrium. Theoretically, there is nothing impracticable in it—for skaters accomplished enough to try it!" (p. 108.) The very year he published this, I was one of the judges in the first New England championship, which J. F. Bacon won over the late Herbert S. Evans—both subsequently American champions—and the skating was mostly continuous on one foot! Souriau might have seen at the New York Skating Club, in the early sixties, Theodore H. Rodgers skate 133 continuous eights on one foot, and then immediately skate 95 more on the other; and at the Vienna Club, in the early seventies, Max Kautz skate 720 eights on one foot without stopping! But he would have seen little grace in any of it. He could not have seen a flying-machine; but the problem of making one seemed to him to present no insurmountable difficulties, not even great ones; his analysis of aerial locomotion convinced him that the plane, with skilful balancing, not with complicated machinery or flapping wings, would soon solve the problem; but he had no intimations of the possibilities of the gasoline engine. Souriau knew not "Kines-thesia" or "Empathy," as such; but his appreciation of "muscular synergy" (pp. 88 ff.)—the integration of co-operative movements—and of "objectified emotions" (p. 163) makes him a kind of Wallace to the Darwins of the esthetic psychology of today. Vernon Lee quotes him approvingly; and his scientific method deserves respectful consideration.

"Even if common experience," he says, "enables us to get along in a passable manner with the ordinary movements of locomotion, abstract reasoning, calculation, theory, are by no means ineffective when we come to the acquired movements of sport and physical training, which form what may be called, in the esthetics of motion, the grand art. Teachers of physical training, riding, fencing, skating, swimming, etc., who know physiology, physics, and mechanics will give their pupils a better method; and if they know how to explain the why of the movements they would have their pupils make, they will secure much more rapid progress."

"The psychological analysis of the movements in locomotion has an interest both practical and theoretical: it may serve us in perfecting the art of locomotion, and it may serve also in providing us a solid basis for our judgements on the beauty of motion. The problems of the esthetics of motion can be solved in a scientific manner. Surely grace is a most charming quality. But isn't it more or less relative? Often quite illusory? How are we to judge it? By the vague feeling of sympathy which the apparent ease of movements rouses in us; by instinctive predilections of taste which, it is said with good reason, there is no use discussing when there are no common principles which can furnish the discussion with a solid point of departure? But in judging of the

beauty of a movement; *i. e.*, of its propriety, of its fitness to the end in view, I can surely reason on principles. When I say 'that's a well-executed movement, that's an awkward gesture,' I assert a truth as objective, as independent of my tastes and of my personal sentiments, as when I report the precise details of an experiment in physics, or detect in a problem in arithmetic a mistake in calculation.

"All critics who have concerned themselves with the esthetics of motion agree in declaring that the most beautiful movements are those in which force is best employed. For a specific example, they will add: 'A graceful skater is one whose movements are best adapted to skating without impairing his acquired speed.' Undoubtedly. But if I skate, what I should like above all else to know is, what positions will give me the best balance, and what movements will give me the greatest speed. If I observe a skater moving awkwardly over the ice, you may tell me that he is using his force inefficiently, and I shall not have the slightest disposition to dispute you; but to clear my judgement, to improve my taste, you must tell me wherein he violates the laws of physics; and if he carries his free-foot in a bad position, how he ought to carry it. If we can't get together here, general principles are no good—mere hot-air phrases. Let us try to apply our principles to the facts. At least, my method has this advantage: if I make a mistake, you will easily detect me."

The author handles many familiar principles and well-known facts in a fresh and frank fashion. He divides his work into four parts: I. The Determination of Movement; II. The Exact Adaptation of Movement to the Desired End; III. The Expression of Movement; IV. The Perception of Movement. I am reproducing only the first chapter of the third part; but to render that more easily intelligible, in relation to the whole, I am giving first a brief summary of the preceding matter, almost entirely in the author's own words, but much condensed.

"BEAUTY is a thing so complex that it is impossible to determine the nature of it *a priori*. Esthetics can never become a science until the processes of the experimental method are applied to it. Can not our judgements in the matter of taste, usually abandoned to the caprices of sentiment, be based on more reliable principles? Can not this art, inferior still because wholly empirical, be given a scientific method? In studying the subject anew, I have tried to discover what can be got out of it, in a spirit less literary than scientific."

PART I. THE DETERMINATION OF MOVEMENT. (pp.9-70)

"In the first part, I study the determination of movement; *i. e.*, the physical or psychic laws by virtue of which we have a tendency to move in one way rather than another. It is evident that this is the first question that ought to interest us... Before judging Nature, above all, before pretending to correct her, it is necessary to learn how to know her. I conceive, then, that our

whole esthetic ought to rest on a knowledge of the movements that are most natural to us.

It is clear that the movements that an animal makes are determined above all by its organic structure... But anatomy indicates to us only the field of our activity; *i. e.*, the different kinds of movement that we can make; it fails to explain to us the play of life; for a being who feels, who thinks, who wills, does not obey a simple mechanical determination. A mechanic has only to take a machine to pieces to tell what kinds of movement it is capable of; with an animal, it is different—the mechanical determination is complicated with a psychological determination, which is perhaps as rigorous as the other, but surely is much more delicate and of another order altogether. It is with this that we shall chiefly concern ourselves.

The pleasure of movement is both physical and moral. Physically, movement serves us in reacting against pain and in satisfying natural needs. Movement is the best of anesthetics... When we have staid too long inactive, how do we feel? Above all, we feel an irresistible desire to move. Like all our appetites, the need of moving, before even any sensation can make us aware of it, manifests itself in the effect which it produces on our imagination. We find a typical example of this "suffrance of enforced repose" in the school-boy waiting for the end of school. His back feels broken, his legs are stiff. Whenever will the bell ring? He feels an almost insane desire, increasing every minute, to jump out of his seat, to yell, to gambol. He wriggles. He drags his feet along the floor. A severe look from the teacher rivets him to his place. He remains quiet. But what torture!

CHAP. I.
THE PLEASURE
OF
MOVEMENT

Motion can give us also a positive physical pleasure. Rapid and noisy movements produce even a sort of intoxication and giddiness that have a peculiar charm... All rapid motions are apt to take away our complete self-possession. We follow our impulse. "It's foolish, perhaps; very well, let's be foolish and unreasonable for once. Louder, higher, faster! The devil take the consequences!" What is this if not exactly intoxication?

To this pleasure, wholly physical, made up of pure sensation, there is added a moral pleasure—the pleasure of sentiment, notably of self-satisfaction, especially in competitive sports and games, and in our struggles against nature. Of all the forces of nature that man regards as hostile and takes pleasure in overcoming, the one that inspires the greatest antipathy, and against which in all his exercises he struggles with most determination, is the force of gravity. The great pleasure in all movements that take us in rapid (horizontal) transit, is in the freeing ourselves for the time being from our feeling of inertia. In this emancipation our gratification consists when riding in a carriage [or automobile], on horseback, on a cycle, in jumping from a spring-board,

or in vaulting. In our contest with gravity, a fall is defeat; equilibrium is only our defensive; the motion of simple progression is the beginning of freedom; ascension into the air is triumph. Architects take their greatest pride in attaining the highest elevations possible, explorers in planting their feet on the highest summits, aeronauts in mounting highest into the ether. [What would Souriau have said of 125 miles an hour in an automobile, and a real aeroplane battle 10,000 feet above the earth?]

To execute any movement whatever, we must make some effort. Objectively, this effort consists in a certain expenditure of energy; subjectively, it manifests itself to our consciousness by specific sensations—tactile, muscular, cerebral (will, imagination, nerve)—always more or less fatiguing; the more so, the greater the expenditure of energy. The most agreeable movements, however, are not those that cost us the least, but those that give us the most profitable return at the least expense. The law of least effort is one of the greatest stimulants of our activity; in determining our movements, it certainly plays the leading role.

CHAP. II.
THE
DISCOMFORT
OF
MOTION

It is easiest to study the laws of movement in the attitudes in which we place our bodies. The attitude which demands absolutely the least effort is that which our limbs assume spontaneously when abandoned to themselves. This primary position, in which the muscles are only half contracted (*the law of average flexions*) is the attitude of relaxation or repose. If we were concerned only with rendering our attitudes as easy as possible, they would all tend to the attitude of least effort, in which each of our members would find itself in its primary position. As a matter of fact, they adapt themselves to the particular action for which we are preparing ourselves. When the attitude is adapted to a specific action, we strive to give it the greatest ease compatible with this object. Therefore, (1) we multiply as far as possible the points of support (*the law of stability*)—in every attitude that is the least prolonged, our body tends to take the position which assures it the most stable equilibrium with the least effort; (2) we apportion our efforts unequally between homologous muscles (*the law of asymmetry*)—if one leg is stiff, the other is bent, etc.; (3) we make our muscles act in turn (*the law of alternation*)—to keep one position very long, it is advantageous to alternate between two dissimilar positions, which, putting different muscles in play, allow each of them to contract in one position and relax in the other; for a muscle is tired more by a slight contraction long kept up than by a vigorous contraction followed by a complete relaxation. Alternation of attitudes is a direct consequence of their asymmetry.

CHAP. III.
THE LAWS
OF
ATTITUDE

Rhythm, exceptional in nature, is the constant law of muscular movements. The tendency to periodicity, however, is not an effort of will; it is due to physiological causes:

**CHAP. IV.
THE NATURAL
RHYTHM
OF
MOVEMENTS**

(1) *the law of compensation*—every extreme stimulation will be followed by a period of inaction, which, in its turn, will give way to a new fit of activity; (2) *the tendency to repetition*—cf. the extra clips of the barber's scissors, or the blacksmith's supplementary blows on the bare anvil; it is difficult to break suddenly a rhythmic movement which has begun to be mechanical—by virtue of habit or of the force acquired, you continue to move a little after you have made up your mind to stop; (3) *the effects of habit*—every rhythmic movement becomes automatic, and the more quickly so, the more uniform it is; every rhythmic movement, therefore, for the very reason that it becomes habitual, is executed with greater and greater facility.

In addition to these physiological causes, there are others of a purely mechanical nature. Each of my limbs has its own natural rhythm, the shorter having the faster oscillations. It is an incontestable fact that men of small size have more vivacity in their movements than men of tall stature; and you will always find among animals of the same class that agility increases as size diminishes; *i. e.*, their members, of themselves, tend to assume a certain rhythm proportionate to their size; and this constant cause always ends by regulating the mean vivacity of their natural movements. For these different reasons, each organ of our motor apparatus necessarily has a tendency to adopt a fixt rhythm, which is its normal movement. But these diverse rhythms, whether of circulation, respiration, or locomotion, all have a tendency to complete unification. [The integration by the central nervous system, of innumerable kinesthetic impulses].

PART II. MECHANICAL BEAUTY. (pp. 71-161.)

We are trying to find out how the elementary principles of mechanics can be applied to the art of motion, and enable us to reason about it while directing our examination upon some specific examples. As to the question of art, we shall look for the solution in some problems in gymnastics; as to the question of taste, we shall analyze the principal methods of animal locomotion. The sight of a movement well executed gives us a real esthetic pleasure, quite intellectual, however, and founded on pure concepts; for we do not judge the movement from the effect which it produces on our sensibilities, but for its own worth, appreciated by our reason alone. From this point of view, we shall indicate the applications of our theory

**CHAP. I.
PRACTICAL
AND
THEORETICAL
INTEREST IN
THIS STUDY**

that can be made to the art of motion, and we shall analyze critically some of the principal methods of locomotion employed by animals, to give concrete example of esthetic judgements based upon considerations purely physical and mechanical.

We may establish certain general principles applicable to all bodily exercises. To give greater ease to our movements, and to expend less energy, it will be found advantageous to adopt movements of moderate speed, to give them as regular a rhythm as possible, and to have recourse to muscular synergy. To make different muscular actions co-operate and not work against each other, it is indispensable that they function in a common rhythm.

**CHAP. II.
GENERAL
PRINCIPLES**

This is what we mean by 'muscular synergy'. In all movements that are a little complicated, the muscles ought to work not necessarily simultaneously, but each in its turn at the proper time; the efficiency depends upon the rhythm that you learn to give to this series of complementary efforts; you must combine them so that each muscle enters into the co-operation in the nick of time, so as to be truly complementary. This is what we mean by 'successive synergy'. The habit of this rhythm once acquired, any unusual movement will seem to you perfectly natural [you will wonder how you ever couldn't do it].

Some problems of *equilibrium* and of *locomotion* can be solved by a little mechanical common sense. Two principles, theoretically

**CHAP. III.
SOLUTION OF
SOME
PROBLEMS
OF
GYMNASTICS**

so simple that it seems unnecessary to mention them, but often neglected in practice, must be kept in mind: (1) To displace a mass, you must have a point of resistance (fulcrum) as well as a point of application—force always acts between the two. When I jump, the effort that I make to push myself from the ground tends to push the ground from me with exactly the same force; and it will always be so, whether my fulcrum be fixt or moving, rigid or elastic. (2) As simple as the first, but often misconceived in practice; viz., physical forces always act in the direction of a line joining the point of application with the point of resistance. When I strike the earth with my foot, my leg is like a force which has its point of application in the centre of gravity of my body, and the point of resistance on the ground. The line joining these two points is my 'line of force.' When my 'line of force' is vertical, I can jump only up; to jump forward, I must begin by letting myself down, or what amounts to the same thing, carrying one foot backward, so as to bring my 'line of force' at an angle with the ground. We shall see that in almost all the problems in gymnastics, the difficulty we find ourselves in at first arises from our striving to find that line by experiment, making efforts up and down until we find a resistance, instead of inquiring at once of our theory in which direction we should make the effort. These fundamental principles once well reaffirmed in mind, we shall be less likely in the theory as well as in the practice of physical exercise, to fall short in mechanical common-sense.

Apply these principles to *problems of balance*: on a bicycle—turn the front wheel in the direction of falling; on the horizontal

bar or tight-rope—move counterpoising weights out and in at right angles to the bar. A body in unstable equilibrium necessarily oscillates. To reduce the effort to a minimum, check the amplitude of the oscillations as much as possible, and render them voluntarily rhythmical. Apply to *problems of locomotion*: in speed-skating, swinging, vaulting, tumbling, etc.,—the skater must always bear on the ice at right angles to the cutting edge; in swinging and vaulting movements, give your push on bringing your centre of gravity near the point of suspension at the moment of rising. Every movement that tends to throw only a part of the body forward or backward is absolutely lost. If in these exercises the whole body is used for propulsion, it is by virtue of the law of synergy—enlisting in the co-operative effort the greatest possible number of muscles [what we now call “the feel”—voluntarily acquired by intelligent kinesthetic observation].

Having indicated by what methods the art of locomotion may be perfected, it remains for me to explain and criticise the results achieved by our fellow-performers in this art. The methods employed by terrestrial animals to move along the ground may be comprised under two types: (1) *creeping*, or *crawling*, in which the whole body is employed in the movement; and (2) *articulated locomotion*, in default of a better word to indicate locomotion by means of special organs.

CHAP. IV.
LOCOMOTION
ON THE
GROUND

Crawling, generally by the lower animals, is of two types: *longitudinal*, as of worms, which advance in straight lines by stretching and contracting their bodies in rings, from head to tail or from tail to head,—the speed depending upon the frequency and amplitude of the stretches; and *undulatory*, as of reptiles and other animals more flexible than extensible, including some with special organs of locomotion, who have recourse to undulatory movements to aid them in swimming and crawling. These combined movements are hardest for the imagination to follow; but the compensation for the effort will be in the esthetic pleasure with which we observe them, when once we have caught on to the rhythm and the mechanism. In this method of progression, one part of the body must necessarily serve as a point of resistance to push the rest forward from, and consequently certain parts recoil or remain stationary while the rest advance. A crawling snake uses the median line of his undulations as fulcrums to push forward the lateral curves [the locus of these fulcrums will be his line of progression]. The crests of these lateral curves may be raised to avoid friction, and the concentration of motor effort along the median line may thus produce astonishing speed; but, at best, force is here used very uneconomically.

If you run over rapidly in mind the multitude of terrestrial animals, you will be struck with the great diversity of their organs of locomotion...[It is not necessary to enumerate their uses here]. From the point of view of mechanical efficiency, all these methods of locomotion can be reduced to two types: walking and jumping, of which walking is the most economical; the jump serves to

secure a sudden acceleration at a special time, and therefore is only a sort of accidental method. The most advantageous method is walking or running nearest the ground, in most nearly straight lines, and least marked by regular time cadence. This remark leads us to foresee a conclusion to which we shall come later; *viz.*, that, in certain cases, the most graceful movements are far from those in which force is most economically employed.

Animals swim by *undulation*, by *oscillation*, or by *direct reaction*. *Undulation* in its simplest form is a kind of aquatic crawl.

CHAP. V. LOCOMOTION IN THE WATER

The resistance that the molecules of water offer by their friction and inertia is exactly equal to the effort that the animal exerts on them by his undulations. Since the friction is slight and the cross section of the animal comparatively small, the slightest pressure exercised by his backward undulations will determine his progression. This method of locomotion, therefore, secures great speed with very slight ex-

penditure of force. (The development of back fins and tails).

The method of *oscillation* recalls the motion of sculling; it is usually combined with the first method, undulations of the body, and then it gives excellent results. If there are any aquatic animals that move by simple oscillation of the tail without assisting their progression with undulatory movements, their system of locomotion is very defective. By movements of the tail alone, a fish can swim only forward; variety of evolutions is obtained by the movements of lateral fins, which also enable him to stop.

In the method of *direct reaction*, the animal, by a movement like that of an oar, pushes behind masses of the water in which he is submerged. This method is inferior to the others for two reasons: progression is jerky; and the return of the oar (fin) under water, even if it does not retard, can not add to the progression. There are three ways by which this handicap is reduced: (1) varying the speed,—letting the oars (fins) drag until momentum is about gone, then bringing them slowly forward for another sudden push; (2) varying the shape,—spoon fins and web-feet, concave or collapsing on return; and (3) when the fin is flat and rigid, returning it edgewise, as in feathering oars on the surface, where alone the oar is most effective. [Hence the superiority of the side-arm, trudgen, and crawl strokes over the breast stroke in swimming for speed.]

We may distinguish three types of aerial locomotion: (1) *vibrating flight*, (2) *flapping flight*, [cf. Vergil's *remigio alarum*, "on the oarage of wings"], and (3) *soaring* (scooting) flight. The first is that of insects. The vibrations are successive, but produce continuous

CHAP. VI. LOCOMOTION IN THE AIR

flight like a screw-propeller. If the vibrations of the wings are fast enough to equal the force of gravity, the insect will remain stationary [like the humming-bird opposite my window as I write]; if the lift is greater, he will rise vertically. To convert this movement into horizontal flight, the insect will only

have to incline the plane of his wings until the force of propulsion, combined with the force of gravity, will give the required direction. The little creature would not be equal to the task, if his muscular vigor were not relatively very much greater, his vital activity much more intense, than other animals'. His motor apparatus is admirable in its simplicity and efficiency, but it is perhaps the least economical of all.

In the flapping flight (*vol rame*), the normal flight of birds of average size, the wing acts intermittently in driving back the air with a sharp blow just as the bird is sinking. It is capable of developing considerable speed, but only at the expense of great effort. Altho' birds' muscles are not capable of any greater instantaneous effort than mammals, they can do in a given time much more work. It may take a man a quarter of an hour to raise his own weight to a certain height; a swallow, resting only on air, can reach a corresponding height in less than two minutes. This system has a great advantage over the first, in that no matter what the speed of flight, the bird can move its wings with only a uniform rapidity, and that very moderate. When a certain acceleration is attained, to exert upon the air the same force without increasing the frequency of the wing-beats, it is only necessary for the bird to strike the air a little flatter; *i. e.*, turn the plane of the wings more nearly horizontal. Then the lifting of the wing again can be accomplished passively by the mere resistance of the air, to which the wing is presented edge-wise in an inclined position like a kite.

The characteristic of the third method of aerial locomotion is that the bird *glides* in the air holding its wings out motionless. Two typical movements, oblique descent and remounting, can be modified or combined in an infinite number of ways. But in the perpetual conversions of height into speed, which constitute *vol-planing*, there is always a loss. If some soarers keep in the air indefinitely, it is because they do not glide all the time passively, but occasionally make positive exertion to regain elevation. Most sparrows alternate scooting and flying, following a very regular rhythm—whence the cadenced flight that characterizes them. Why? We know from our own experience that violent efforts followed by complete relaxation fatigue less than more feeble but continued efforts. All this is easily understood; but here's a difficulty. Many reliable observers affirm that some soarers (like the albatross, frigate bird, etc.,) can remain in the air for hours without a single flap of their wings. Can such floating be employed for active and continuous flight? With the aid of a simple plane surface, constantly supported in the air, might not only indefinite suspension but acceleration also be attained? Mechanically, the thing is possible. All that would be necessary would be to execute in the air a kind of see-saw movement. We have seen in swinging how little movement of the centre of gravity at the moment of rising is necessary to give considerable acceleration. The oscillation that the board executes in catching its fulcrum on the cords to which it is suspended, the wings of the bird could reproduce exactly in catching their fulcrum on the air. In

vol-planing, then, making a more or less regular see-saw movement so slow, so continuous, and so slight as to escape observation—will give the bird a powerful impulse. He will thus regain the height which the passive remounting makes him lose at each swoop, and he will therefore be able to maintain himself indefinitely in the air. In fact, isn't this just what the soarers do? At any rate, this method of aerial locomotion would not only be possible in theory, but be more advantageous than all others; and it is this kind of flight that will be most easy to reproduce artificially. [And so it has proved; for the gasoline engine has relieved all the psychologist's doubts as to whether "man would have force enough to regain at each swoop all the elevation that the passive remounting would necessarily make him lose."]

In the course of this study, the reader can hardly have failed often to be struck by the cleverness, the real ingenuity—the word is no exaggeration—of some of the methods of locomotion employed by animals. People have sometimes gone to a good deal of trouble to prove that animals have, in germ, some of the artistic faculties that have gained with man such a marvelous development. It is pointed out that in their constructions, their song, their preference for certain colors or certain forms, there is something which much resembles the sense of beauty. Doubt that animals have an art! But art is everywhere in animal activity; it is in the flight of that swallow skimming thru the air; it is in the movements of that beetle crossing your garden path, of that snake creeping along the hedge, of that little fish swimming in the brook. It began with life itself. Perhaps the regular undulations of the reptile, the oscillations of the tail of the fish, the normal movements of the bird and the quadruped, are determined once for all by an instinct purely mechanical. But observe a snake climbing a rock, a trout careering in a pool, crows vol-planing round a belfry, young kittens playing. Is it nothing but automatism?.. We admire a line drawn on a sheet of paper by the hand of an artist; but may there not be as much grace and as much actual beauty in the curve described in the sky by a flying bird? Why should we not say that that curve, too, is a work of art? Is it because it leaves no material trace? Perhaps, after all, is it not just because of that?"*

ART IN ANIMALS

PART III. THE EXPRESSION OF MOVEMENT

When we consider the movements executed by another person, we can hardly fail to think of the various feelings and sensations which determine those movements—make the person move in just that way. These emotions, these sensations, perceived by sympathy, form what is called "the expression of movement."* *

* Here is a meagre outline of only half this interesting book (161 pages). The most interesting part comes next: Part III (pp. 163—220). Chap. I, The Expression of Ease, Chap. II, The Esthetics of Force, Chap. III, The Expression of Moral Sentiments. Part IV (pp. 221—323) deals with the perception of movement, especially in art and music: Chap. I, Tactile Perception, Chap.

The expression of physical and moral ease in movement is what is called grace. Knowing what the movements are that are most agreeable to us to execute and that best economize our efforts, we possess, it might seem, from the start, all the elements of grace. But that is far from the case: for we shall soon see that grace is reducible neither to the efficient use of force, which is only mechanical beauty, nor even to the least effort in action.

CHAP. I.
THE
EXPRESSION
OF EASE

Herbert Spencer, in his *Essay on Grace*, remarks that in general the graceful movements are those that require the least expenditure of force. "This connection between gracefulness and economy of force will be most vividly recognized by those who skate. They will remember that all early attempts and especially the first timid experiments in figure skating, are alike awkward and fatiguing; and the acquirement of skill is also the acquirement of ease.

GRACE AND
BEAUTY OF
MOVEMENT

The requisite confidence and due command of the feet having been obtained, those twistings of the trunk and gyrations of the arms, previously used to maintain the balance, are found useless; the body is allowed to follow without control the impulse given to it; the arms swing where they will;† and it is clearly felt that the

II, Visual Perception, Chap. III, The Movement of the Eyes, Chap. IV, The Pleasure of the Eyes, Chap. V, Auditory Perceptions, Chap. VI, Sonorous Movement.

* * It is important not to confound the *expression* of a movement with the *impression* which it produces. The impression consists of the personal emotions of the spectator; the expression, of these same feelings objectified; i. e., attributed to the person who executes the movement, thus forming a kind of a spectacle, as if they were actually perceived. [This statement is an early anticipation of the "new" psychology, developed by Wm. James, in his theory of the participation of organic functions in emotion and thought (muscular tensions and sensations of bodily changes in the subtle apparatus for equilibrium, and of altered respiration and circulation, (1890); by Theodor Lipps, in his theory of "Einfuehlung", the attribution of our own modes of movement and dynamic experience to visible shapes (Raumaesthetik, 1893-97); by Karl Groos, "Innere Nachahmung", 1892, 1899, 1902—"in complete esthetic enjoyment, there are present motor phenomena of an imitative character, and these show that the participation in question is a bodily participation" ("aesthetisches Miterleben, 1909")—hence, the modern doctrine of "Empathy" as translated by Titchener, "Psychology of Thought Processes", p. 21, 1909, and most fully expounded by Vernon Lee in "Beauty and Ugliness" (1897), 1912, and "The Beautiful", 1913.

Neurons were not named when Souriau published this book. The physiology of the "central nervous system" was then in its infancy. When we realize what involuntary motor changes normally take place under emotional excitement through the activity of our "autonomic nervous system" (Cf. "Bodily Changes in Pain, Hunger, Fear, and Rage," Cannon, 1915); when we appreciate what experiments with animals in numerous psychological laboratories in the United States have revealed in recent years as to the potency of kinesthesia; and what modern neurology has taught us of the fifteen or twenty special senses (in addition to our original five) and of the multiplicity of sensory end-organs, especially in our joints, tendons, and muscles; when we recall the old familiar phenomena of mind-reading (i. e., muscle-reading, -- "there is always a motor organ linked with every sensory organ"), and remember that there are now instruments delicate enough to register the involuntary movement of one-two hundredth of a millimeter in the human elbow, -- we can the more easily understand how slight the actual muscular tensions and sensations may be that accompany the empathetic "merging of the activities of the subject in the object."

"Motor activity," it must not be forgotten, as Judd says (Psychology, General Outline," p. 183), does not always manifest itself in the form of movement. One may hold his arm rigidly in a fixed position and be doing more muscular work than if he were executing a movement through space. The erect position of the head is maintained by a constant contraction of the muscles of the neck; the tendency of the head to fall forward is shown the moment one becomes drowsy and relaxes his activ-

graceful way of performing any evolution is the way that costs the least effort. Spectators can scarcely fail to see the same fact if they look for it. Perhaps there is no case in which they can so distinctly perceive that the movements called graceful are those which fulfill a given end with the smallest expenditure of force." I might cite another example in corroboration no less significant. Watch a dog which his master has thrown into the water for the first time. When the poor creature appears on the surface, half dead with fright, his eyes starting out of his head, he makes a dash for the shore with convulsive precipitation. Engrossed in keeping his nose out of water as far as he can, he swims high, beating the water with his feet ["dog-paddle"] and making little headway! At last, he reaches shore, panting and exhausted, with hardly strength enough to climb the bank. Observe him a little later, when he has acquired a taste for swimming: he assumes the position of least energy, lying comfortably on the water, above the surface of which his nostrils hardly emerge; and he progresses with a rapid, supple, undulating movement, which no longer tires him, but gives, to all appearances, the impression of ease.

It is quite natural that it should often be so. By a judicious use of my power, I spare myself all superfluous motions and profitless efforts, and can thus get better results at less cost. Consequently, it is not surprising that when I apply myself to the efficient performance of an exercise, I succeed at the same time in accomplishing it with more grace. Reciprocally, in aiming at grace, I may

ity. Every waking individual is intensely active, whether he is moving about or remaining in a single position. Examples could be multiplied without limit to show that every change in experience, whether it is initiated by a change in the sensory stimulus or by some internal cause, is accompanied by changes in muscular tension." When therefore, we observe the movements of another person, we cannot escape parallel kinesthetic reactions in our own muscles; and to judge fairly of the ease and grace of the other, the spectator must have sufficient experience of the technique of the art under observation to feel himself empathetically in all the movements. Otherwise, his judgements will be mere impressionism, inspired by prejudgments based upon experiences that may or may not be parallel. (G.H.B.)

† Here H. Spencer makes a mistake. Undoubtedly, there is no need of one's thinking much about the movement of his arms; but their movement must contribute their share to his balance and even progression, conforming to the law of muscular synergy. A fencer ought not to have to think of the way he holds his left arm; but to economize his efforts and to give more elegance to his movements, should it be said that he ought to let it "swing where it will?" [In most modern physical arts and sports, there are pretty definite rules for "good form" in the elementary stages. Like the conventional leads in whist, these positions and movements have been determined not by theory, but by long and scientifically observed practice. In some of these arts, notably artistic skating, it is easier to do the elementary movements in what seems at first a more natural way than in that prescribed by the rules for good form, as it is easier to manipulate a type-writer with one or two of the stronger fingers; but just as it is eventually more efficient, both in speed and accuracy, to use all the fingers co-operatively and to manipulate the key-board kinesthetically, without looking, so it is more efficient to learn the correct skating positions and movements at the beginning, so that when you come to the harder figures, where they are absolutely essential, they will have become easy and natural to you. To make these economical but at first strange positions and movements easy and natural, so that you can take them and do them without looking, or thinking of them, is the first peremptory demand of grace. In any of these arts, however, when learning the first steps *correctly*, you are apt, in striving for a new grace, to lose whatever grace you may have had. The novelty and the strangeness make you self-conscious. In utilizing opportunities for practice in overcoming these inhibitions of grace, the artistic skater, in spite of increasing artificial-ice rinks, is at a greater disadvantage than most, by reason of the uncertainties of ice, and the shortness of his season. Tho' tennis, golf, swim-

usually gain some economy of power. [Cf. piano and violin practice.]

After all, H. Spencer's idea, taken as a casual remark, applicable to a majority of cases, is all right; but if you would have a complete theory of grace, an absolute principle by which to measure the charm and grace of motion in proportion to the economy of energy; or if you would resolve one of the most complicated problems of esthetics to a simple question of physics, then we can not accept it. Attractive as that simplification might be, we must renounce it in the presence of the difficulties that present themselves when we examine the theory a little closer. Grace is something more complicated than mere mechanical beauty; to be graceful, movements, of course, up to a certain point, must conform to the conditions of beauty; but something more is needed.

I have seen some English students who skated remarkably well. Their idea seemed to be that of Spencer: to obtain the maximum of speed with the minimum of effort; and yet they were not graceful—just because their stroke, tho accurate and energetic, never sacrificed anything for the pleasure of the spectators. They skated for themselves, not for the onlooker. It was quite the utilitarian, economic style, but it gave no suggestion of art; you had a display of great muscular activity, perfectly employed. It was mechanical beauty, perfect of its kind, but still mechanical. What else did it need? A little less stiffness of pose, more suppleness in the waist; a little imagination and individual fancy in the action—I don't know exactly what, but surely something. Perhaps it isn't possible to be more graceful and go so fast. Then it would be better not to go so fast, if you are to appear graceful.

It is evident, as a matter of fact, that the economy of forces can give to each exercise only the grace compatible with that exercise. If you are not extraordinarily strong, try to hold out at arm's length a weight of 45 pounds. What contortions you will go through and what an impression far from graceful you will make on the spectator, no matter how well you employ your strength! Grace, then, cannot be measured by economy alone; *i. e.*, as regards the energy developed or work produced: the absolute value of the effort must also be taken into account.

ming, etc., may keep him in good physical condition, they do not ordinarily develop the rotary waist muscles, springy knees, and "spread-eagled" hips, knees, and ankles, requisite on the ice in positions of efficient equilibrium on one foot. I don't know by experience how it is with swimming and the other physical arts. — I have as little sympathy with the "hang your clothes on a hickory limb, but don't go near the water" method as with the Wisconsin theory that there can be no transference of power or skill from one physical art to another,—but I do know, both from personal experience and from observation, that not only valuable muscle training, but also, what is even more important, easy familiarity with fundamental skating positions and movements, can be obtained by two or three minute daily exercises (while you are dressing in the morning) which will materially expedite the kinesthetic acquisition of the right "feel" and balance absolutely prerequisite for the acquisition of grace on the ice. Mirrors and critics are a great help; but nobody can give you the right "feel" but yourself; and you can get it better, on or off the ice, by learning to interpret correctly the kinesthetic impulses that throng from every active joint, tendon, muscle, and sensory end-organ in your whole body, than by vainly striving to see, in your mind's eye, a moving-picture of yourself as others see you. This is our modern way of "conforming to the law of muscular synergy."—G. H. B.]

It would not be exact, either, to say that the most graceful movements are those that tire the least. One day, at a long-distance running match by a professional runner, I was struck by the fact that from his very first steps, he ran like a tired man, form bent low, a little trailing, shoulders swinging. The method, however, is perfectly logical. When you are tired, all efforts count. You economize them.

**GRACE AND
THE LEAST
EFFORT**

The gait of a tired man is one that really tires the least, and one that you can keep up longest; but it is not necessarily graceful. At the beginning of a mountain climb, compare the heavy tread of the guide with the high, elastic step of the tourists whom he is leading! The gait of the guide is incomparably less graceful, but he can keep it up indefinitely; whereas, the amateurs who are obsessed with the idea of presenting an agile and vigorous air, rapidly wear out their strength. When you lift a heavy weight, the lines of your face have a tendency to contract, out of sympathy with your muscles; and if the effort is really intense, your whole figure takes on an expression almost of pain. If you wish to do this feat gracefully, you must repress these grimaces and force a most amiable smile, which counts for much under such circumstances. Grace will then be achieved by a supplementary effort. Watch a rope-climber in the gymnasium—his *work* will be more graceful if he lift himself in a rhythmic movement, as if each lift cost him nothing, and as if each contraction of his arms would make him overreach the end... If you can manage your efforts admirably and not give the slightest impression of grace; if you can assume all the appearances of fatigue in order to avoid fatigue; if you can tire yourself all out in trying to avoid the appearance of being tired—the conclusion is irresistible; real economy of effort is no adequate measure of grace.

Let us then give up these attempts at simplification and resign ourselves to the study of the conditions of grace in their actual complexity. Try as we will, we shall never be able to prevent their really consisting of simple appearances. We have a good right to hope that it will not always be so. The analytical study of the physical and mechanical conditions of locomotion exercises an undeniable influence on our esthetic judgements by rendering them more reasonable. The ideal would be to have them become entirely so; then there would be an end of that sort of antinomy that we have pointed out between grace and beauty of motion: the movements that would give us the most pleasure to look at would then be those that really have the greatest physical beauty. But until that happens, we shall probably continue to judge things with the prejudice of common experience, which reflection will never completely uproot.

To establish the conditions of grace, then, we ought to concern ourselves only with first appearances, which alone determine our esthetic impression.

For a movement to create the impression of physical ease, many conditions are requisite, of different degrees of importance:

The most important of all is conformity with our natural ways of doing things; which goes to show that if the value of beauty is in itself, grace is entirely relative. We may observe very accurately the motions of an animal or a man, and judge whether they are adapted to their end; but we can not judge the feelings of another except by analogy with our own feelings; in imagination we put ourselves in the other's place and attribute to him the feelings that we should have in similar circumstances. To what

**1. CONFORMITY
TO OUR
INDIVIDUAL
HABITS**

illusions this transference of personality exposes us is obvious. I observe a peasant woman sitting on a wagon seat, her back straight, her basket on her knees; she will stay in that position until her journey's end—for hours. She gives me sensations of cramp, stiffness, constraint; I suffer for her. But she experiences no embarrassment of that kind; she feels no need of relaxing, and consequently does not suffer from her stiffness—she's all right! My thinking the turtle's gait too slow, too fatiguing, is mere illusion. As a matter of fact, it costs him no more effort to walk than it does the hare to run. A left-handed player throws a ball with his left hand as easily as a right-hander with his right; but the right-hander, seeing a ball thrown with the left hand, thinks the action ungraceful because, if he had to throw with his left hand, he would find it awkward and fatiguing. Hence the prejudice which assumes that left-handers are less adroit than right-handers. The movements of a snake leave nothing to be desired physically to produce the appearance of grace; most of the definitions of grace, as to attitudes, movements, lines, would apply to the snake better than to any other animal. And yet, one would have to be pretty philosophical to get much pleasure in observing his evolutions. We not only feel a natural repugnance, an instinctive apprehension, but we can not even in imagination sympathize with such attitudes, such movements—they are incompatible with our make up. We can comprehend what it might be to be a bird, an ant, or even a lizard; but to be a snake, to have neither arms nor legs, to get ahead by wriggling, to screw in a spiral, to crawl on yourself—the mere suggestion puts the imagination on the rack—"think on't again, I dare not."

When we watch an athlete doing some feat, what do we look at first to judge of the effort he is making, of his strength and vigor?

**2. ABSENCE
OF
VISIBLE
EFFORT**

His face. If he does his stunt without knitting his brow, without growing red in the face, without his veins swelling, he will give us the impression of ease in the employment of his strength. People who show these signs of muscular effort more than others, always seem less graceful in the physical exercises in which they indulge. Those who grow red in the face at the slightest effort, no matter what their agility or their strength, can never give the impression of perfect ease. The true

athlete, then, ought to have a colorless complexion. The conventional white paint of clowns, originally devised to make them more comical, secures an unintended effect—it renders them more graceful; for on their blank faces, traces of effort are no longer visible; as they perform feats of incredible agility, their grotesque mask remains impassive—almost indifferent to what is being done by the rest of the body. I recall once being present at a day-light rehearsal of a circus when, naturally, the clowns were without their make-up. It was a disillusionment—no longer those elastic, bounding, fantastic creatures, as they appeared in the glare of the lights; but common-place young men of ordinary enough type, working conscientiously to perform feats evidently of great difficulty!

Not only by the eye, but also by the ear, we judge of the ease with which a movement is executed and of the effort which it requires. We are in the habit of judging of the violence of a shock by the noise which accompanies it. Every big loud noise gives the idea of a big moving mass suddenly arrested, of a great active force suddenly stopped. External sounds

3. ABSENCE OF NOISE

that accompany movements ought, then, to be taken into account in the estimation of the effort. Useful in certain cases for marking a motor rhythm (like the tic-tac of a pendulum), or to give the impression of power (like the splash of a boat cleaving the waves), they are always incompatible with grace, properly so-called. Sometimes they will increase the apparent difficulty of a movement (flapping of the wings of a big bird taking flight); sometimes they will give the impression of heaviness (horses careering on the stage). On the other hand, silent movements seem to do their work all by themselves (jumps on a thick carpet, the tread of felines, the flight of owls). To this absence of noise the play of light owes its appearance of fantastic lightness, like the moonlight on the sea, the aurora-borealis, the reflection on the ceiling from a vase of water. [I wish I might have formulated this psychological defense when I was taken to task for marking down the grace of some Ottawa skaters, once, for crunching the ice.]

We are in the habit of roughly estimating at a glance the volume and the density of bodies. The effort necessary to move or lift an object being obviously proportionate to its weight, the movements of an object or of an animal very big and very heavy appear to us rather fatiguing. That's the reason why, in general, little animals seem to us more graceful

4. APPARENT LIGHTNESS

in their movements than big ones. But it seems to me that in the estimate of the weight of things which we ordinarily make, we consider rather their density than their mass. A cloud seems to us light; the rain that falls from it, heavy. We ask a child which is heavier, a pound of lead or a pound of feathers; and he gravely reflects on the problem—which goes to show that for him the weight of some things is rather a question of density than of mass. These elementary notions necessarily have an influence on our esthetic judgements.

In this way I should explain the fact that animals with a smooth

skin like snakes and frogs, with shells like turtles, with hard and polished wing-cases like June-bugs, seem to us at first sight heavier than others; and that furry, hairy, feathery animals seem lighter. This outer covering does increase the actual weight a little; but tho' it adds much more to the apparent volume, really makes it seem less heavy. When we see a bird flying, we are not surprised that it can sustain itself in the air so easily; to our eyes, which judge things only superficially, it seems all feathers—almost lighter than air. But tumble it to earth with a shot, we are surprised at the heaviness of its fall, and of its real weight.

The shapes of animals are not less to be taken into account. The big belly of the cow, or the hipopotamus, the head of the ass, the hump of the camel, the beak of the toucan, add appreciatively to the weight, because to our eyes they are all a dead weight that can't help retarding the free movement of the creature that possesses them. Whereas, the development of their motor apparatus, tho' excessive, contributes to giving them an appearance of lightness.

For a movement to be easy and to appear graceful, the point of support must be solid, and look so. There is nothing so ungraceful as walking in the mud, in the snow, in the sand, or over spongy ground; you can't help feeling that part of your strength has been spent in making the foot-prints. The very fact that visible traces are left, makes the movement less easy. When the point of support is sliding or unsteady, the appearance will be still worse, because then the loss of power will be more directly perceptible. It makes one tired

to see a man trying to walk on glare crust or climbing a sand dune, a boatman rowing against the current, a squirrel in a whirling cage, or a horse in a treadmill,—the appearance corresponds exactly with the reality, the expression of effort with the waste of energy. On the other hand, and for the same reason, jumping from a spring-board or a tight-rope, is graceful, because the elasticity of the point of support is felt to add to the impulse. The most fugitive point of support is surely the air. The flight of a bird is really a continual fall counteracted by a continual effort to rise. It would seem that of all movements this ought to be about the least graceful. Why isn't it? Well, not flying ourselves, we have no common measure to judge of the effort required to fly; and since the movement of the air fanned by the wing is invisible, our eye sees only the work done: we simply note that the bird goes very fast, and we conclude that he must go with ease.

Finally, it is necessary that the apparent resistance be reduced to a minimum. A boat which makes the water spout in front of it or draws a mass after it in its wake, seems to move with difficulty. The trick of the paper hoops which circus riders burst in their flight is not graceful; there is no real resistance to speak of, but there is an apparent obstacle, and that is enough to spoil the looks.

Here comes a difficulty peculiar to swimming and flying. An

animal that moves in a uniform and homogeneous element like water or air, finds resistance in it at the same time that he finds his fulcrum; and if the feeble density or the mobility of the element in which he has to put himself in motion, is favorable in one sense, it is unfavorable in another. What ought to be the effect of this kind of physical contradiction on the appearance of the movement? Sometimes the idea of unstable fulcrum prevails, sometimes that of resistance ahead—the first, when it is a question of slow movement; the second, when of rapid. At the moment when a bird takes flight, his loud flappings producing only a moderate movement, we are aware of the force lost; but once his momentum is established, each flap of the wing carrying him farther away, he seems to find in the air a more solid fulcrum. This is true, anyway; for thanks to his progression, his wings find all the time new beds of motionless air, the inertia of which furnishes him the resistance which he needs for his fulcrum (cf. the instantaneous photographs of birds in flight). At the same time, the resistance ahead, which was almost nothing at first, acquires an appreciable force. Since it increases approximately according to the square of the velocity; and, accustomed as we are to observe it when we set ourselves in motion, it seems to us that the bird must make an effort to cleave the air, to struggle against the wind. (So of a steamboat starting from the wharf, or a swimmer.) In short, the moment when the movement seems easiest will be when the velocity will have attained an average rate, because then the mobility of the fulcrum will have become insensible, and the resistance ahead will be no longer strong. Again, we see that it is at mean velocities that movement acquires its greatest esthetic value. Here as elsewhere, beauty is above all a question of the right mean.

THE MORAL EASE OF MOVEMENT.

The difference between mechanical beauty and grace will appear more clearly when we take into account the second condition, the moral element. The more regular a movement is, the more rigorously adapted to its end, and the more economical, the more beautiful it is (according to physics and mechanics); but to produce the expression of grace, the rhythm must not be too monotonous, the object not too apparent, and the economy not too strict.

A rhythmic movement too regular has the disadvantage of appearing absolutely mechanical. Cf. the effect of the regular movements of idiots, the involuntary movements of nervous people,—twitchings, twistings, tappings, etc., the more irritating when accompanied by noise. We are pained, because we instinctively feel that these reflex movements must be tiresome to the people who make them. But, all physical sympathy aside, and even when the person who makes these absolutely regular rhythmic movements seems to take pleasure in them, the sight is unpleasant to us because it does not give us the impression of moral ease... The cavalcade on the Parthenon

1. FREEDOM OF RHYTHM

frieze gives the impression of an easy movement because the attitudes of the horses, tho perhaps a little monotonous, are not identical. Grace is not sacrificed to decorative effect. In the Italian ballets given at the Eden-Theatre, in Paris, the effects of repetition are overdone. A hundred dancing girls canting their heads to one side, bending and raising their arms, all at once, have rather the air of well articulated dolls than of dancing women—a very pretty feat from the point of view of training and discipline, but a great mistake from an esthetic point of view. In the great majority of physical exercises in which we indulge, especially games, we have a noticeable tendency to vary the natural rhythm of our movements for the sole pleasure of varying them. We are following not only the law of least effort, but the law of activity. We like to put our energy, our initiative to the proof; we react against the automatism that usurps us. Feeling that there is something mechanical in movements too regular, we free ourselves from their rhythm just to avoid having the appearance of machines. Movements, then, really have grace only when we feel that their rhythm is taken up voluntarily, when we are free to throw it over whenever we like, and when there is ample field for individual whim and fancy—like a convenient rule which is not to be too rigidly obeyed: for next to the pleasure of observing a rule is the more agreeable pleasure of breaking it. (Applied to music and poetry.)

Finality is a law as tyrannical as rhythm; for it, too, constrains our movements to follow a predetermined order. Only by not conforming too rigorously can we give the impression of grace. Almost always the activity of sport is more graceful than the activity of labor. The laborer is serious. That the activity of work often has more beauty and

2. FREEDOM OF PURPOSE

always more dignity than the activity of play, I freely admit; but that it has more grace, I am loth to grant. Why shouldn't the movements that we make for the mere pleasure of moving give the impression of greater ease than those whose object is the very opposite of mere pleasure.* The same exercise will give us an expression of ease or effort according as we see it as a distraction or a task. The expenditure of energy may be exactly the same—the sole difference of intention, of sentiment, suffices to affect the impression made upon the spectator. And this liberty of purpose applies to the movements of animals, also; and by analogy or metaphor even to inanimate things. The swingings of a branch in the wind, tho in themselves as much enforced as the swinging of a pendulum, seem more free because we cannot anti-

* Souriau does not imply that work does not give pleasure; but, like Joseph Lee, (*Play in Education*), believes that not until work becomes a kind of play can the impression of enjoyment or of ease and grace be given. "True work is the highest form of play; but it is always the play element in work that is most important."—(p. 52). "I enjoyed a very pleasant game of golf yesterday afternoon with my brother and his son Arthur" says Ed. Howe, quoted in *The Independent*, Oct. 13; "we pitched green alfalfa on a wagon and hauled it to the pigs. Then we took a drink of spring water and felt greatly refreshed after the exercise." If this "remarkable remark" is only a humorous version of an oft-repeated insistence that the same exercise ought to be as profitable in feeding the pigs as in playing golf, it is, quite aside from the question of ease or pleasure, very poor psychology.

cipate them so precisely, and therefore they seem more graceful... In general, every body that moves in a straight line, like an arrow in flight, a rolling stone, or a torrent sweeping down a mountain, seems to have an object and to be bent on attaining it; on the other hand, an uncertain or sinuous movement, as of a feather floating on the water, an autumn leaf falling, a brook meandering through a meadow, gives an impression of fancy, of caprice, of liberty, and consequently of grace.

Not only ought we to sacrifice, if need be, economy to grace, but it is well, from time to time, to sacrifice it visibly. Beauty is made of luxury, and whatever aims at economy is the very antipodes of art. Do your best at economizing your strength, but don't show that you are economizing. Why are certain attitudes, very comfortable in themselves, most ungraceful? Just because they are too comfortable! It's the same with movements—too obvious economy robs them of their grace. A certain prodigality in the expenditure of force is at times useful for allaying the suspicion of parsimony. In all the arts which can give us the impression of graceful movements, even in the most indirect way, you will find that little shows of force, some little bravado of difficulty overcome, will by an actual intensification of effort dispel the impression of effort. (Cf. the gratuitous variations and flourishes which opera-singers, violinists, pianists, drum-majors, bandieristi, and even poets, sometimes indulge in, to display their perfect ease and command.)

ART AND GRACE.

What we have just said leads us to think that true grace should not be found accidentally in nature, in some way or other, but should be intentionally sought. Made of appearances, it presupposes some concern for looks and some anticipatory considerations really artistic.

'Grace', says Schiller, 'is a beauty which is not given by nature, but is produced by the subject himself.' Nothing truer. Undoubtedly grace presupposes some natural gifts: a supple, alert, vigorous body; a plastic beauty, so that the exhibition made of the person not only excites no ridicule, but presents an attractive appearance; and, finally, an instinctive sense for rhythm and harmony. With this endowment, one may easily become graceful; without it, do what one may, one can never succeed in being graceful. All the rest is our own work, the product of our own activity; and I may add a product conscious, intentional, artistic, at least in the higher forms of grace. To be truly graceful, we must be conscious, if not of making positively graceful movements, at least of avoiding awkward and affected ones; we must keep a kind of watch over our positions and motions; we must strive for perfection in action, a little for its effect on those who are looking at us, but more for our own self-satisfaction, and, what is still more important, for the love of art.

This seems, it is true, to contradict a generally admitted principle; namely, that naturalness is the essential condition of grace. The most elegant movement in the world, if I feel that it is made with a consciousness of its elegance, ceases to please me—it is no longer liberty of movement, no longer perfect ease; there is in it, if not a physical effort, at least a moral constraint, which cannot fail to produce an unfavorable impression on the spectator. Besides, does not experience warn us that the more we seek grace, the faster it flies; and that the less we concern ourselves with our movements, the more natural grace they will have?

In general, every motion useless in itself is fatal from the point of view of grace. Your eyes light upon a little girl playing with her companions—she runs, jumps, dances with the utmost grace in the world. But she catches sight of you looking at her. She immediately assumes affected attitudes, poses for grace—the charm is broken! You admire, at the circus, a performer's wonderful feats on the flying trapeze—he leaps into the air, seizes the bar in his flight, regains his equilibrium! So long as he thinks only of showing off his skill, he gives the impression of perfect ease in every movement; but see him, at the end of his performance, bid farewell to the applauding spectators—he takes a few mincing steps across the arena, places his hand on his heart, and bows. All the while, he is striving to be graceful, but all the grace is gone!

Yes, it is true, to attain grace, you must not be too much pre-occupied with it. The affectation noticeable in those who wish to appear graceful, arises from the fact that their preoccupation is something novel or exceptional. They suddenly take it into their heads to give us an exhibition of supreme elegance, of perfect distinction. That is going at the business too quickly—they are not yet ready for the task. It must not be forgotten, however, that there is a kind of 'mutual education society' for grace—a mother, for example, will give good advice to her daughter; her friends will take it upon themselves to correct, with a smile, her faults of taste.

In the acquisition of grace, whether simply a question of motions of the body, or of that much more complex grace—of manners—there is a time of transition, a thankless age, when one loses the natural graces before attaining acquired grace. When you begin to do things voluntarily and on principle, you do them worse, at first. The grace you hope to get spoils the grace you have! When you begin to think about them, spontaneous movements become constrained; the attention which is given either paralyzes or exaggerates them. But they recover their grace, and even acquire a superior grace when they become so habitual that they are produced by simple reflex action. Then you will not have to be concerned with the position of your hands or feet, or the movement of your little finger; and the result will be a feeling of ease in your whole body.

This [kinesthetic] automatism is the indispensable condition of progress. In fact, the perfect harmony of movements requires the co-operation of a great many contributing movements. The

attention being naturally limited in range, it can keep watch over only some of them, leaving the others to take their natural course. (That's the way to do, Franklin recommended, you know, to arrive at moral perfection.) We endeavor, then, to train our muscles successively for the desired movement. When each of them has acquired its routine, and can function instinctively, we have only to signify to the body to execute this or that movement, to have it immediately obey. . .

It is important not to forget, even in those movements that have become natural by force of habit, that something is left for the will to do. When "spontaneous," "unconscious" actions are mentioned, the words must not be taken too literally. Even if it is not necessary to pay special attention to the details of our movements in order to acquire ease, it does not follow that we can leave our members to function solely by virtue of pure automatism. Acquired grace is not mechanical grace. The will always has to come in to keep the body awake, alert, ready to obey the slightest command. It must maintain harmony between divers forces which would soon become conflicting if left to themselves; it must speed up or slow down their action according to circumstances. In an orchestra, when each musician knows his part well, the leader has less to do; and for this very reason, he can serve to better advantage: he can direct the movements, watch the entrances, indicate the shades of stress and tempo, centralize all the partial movements to make them co-operate in the movement of the whole. The higher grace always has something intentional in it. From beginning to end, it remains a product of art.

But at least, we shall be told, this art must give us the illusion of nature in doing its best to conceal its art. . . The more I reflect on this theory, the more it seems to me a mere phrase, corresponding to no real exigency of our taste. Why should the thought that the beauty of a work is due to the intention of the author have power to lessen its merits in my eyes? On the contrary, it ought to enhance them. I hear a nightingale singing in a clear night. Ought I, so as not to spoil my pleasure, think there's nothing intentional either in the hour or the song; that the bird is singing simply because the brightness of the moon keeps her awake; and that the nature of her song is determined solely by a law of least effort, a mechanism, a chance,—what you will, provided it be not choice. Evidently not. . . The idea that the grace of movements is absolutely natural, *i. e.*, that taste or choice counts for nothing—that it is all chance or all automatic—would prevent my admiring it. I don't want it to have an air too much tried for, too obviously prepared; but it still must seem to me intentional.

I would go a step farther. To my mind, a bit of coquetry would not be amiss. I can't for the life of me see why this art should affect disinterestedness and try to please us without having the appearance of being interested in our opinion. In fact, complete disinterestedness is impossible. . . It is very difficult to believe in the naive, spontaneous, unconscious development of grace;

on the other hand, everything tends to show that it is derived from the instinct of coquetry. And what's the harm? It would not show a very commendable disposition to find fault with beauty for putting herself out a little for us, for being willing to make some advances to us, and for showing some interest in our good opinion. Is the desire to please no longer a charm? Why, then, should we care to have grace without it?

THE EXPRESSION OF FEELING

The will, however, never absolutely determines either my actions or my positions. I wish to turn my head: but at what angle or at what speed? I never should have thought of that. If I do think of it, it will always be in a very vague way. The most resolute will in the world always has something irresolute in it; it directs movement only at large, neglecting always every little detail of execution; it might be said to determine only to what general category a premeditated movement belongs. Whence, then, comes the increase of determination necessary for the eventual production of the movement? From causes which are strangers to the will—from the spontaneous contraction of the muscles, from simple reflex actions [kinesthetic reactions]...

It is thus that our feelings determine our actions and our attitudes. The attitudes truly expressive are those which do not aim to express anything, but are unconsciously determined by an emotion profoundly felt. Take the most simple example in the world—that of reaching out and taking a cup. Suppose it taken by Alexander in the presence of his physician, Philip; by Socrates ready to drink the hemlock; by Faust in despair at the hollowness of life; by a child resigned to drinking a glass of Sedlitz water. The intention will be the same in all; in all, the hand will reach out toward the cup. But what differences in the action, according to the feelings which inspire it! In the first case, it will show firmness, loyalty, with a touch of defiance and bravado; in the next, disdain, indifference, with a trace of irony; here, despair, the sheer frenzy of suicide; there, resignation and defiance. Substitute for the action a phrase; *e. g.*, "Oh, well! die if I must!" and note the inflection according to the situation. The words will be the same in each case—but how the tone will vary!* These particular shades of action and attitude, which have completed the determination of the desired movement, comprise what Schiller so aptly calls the *tone* of the movement.

When we see a person acting under the influence of any emotion, our attention may be especially directed to three things:

1. The movements themselves;
2. The emotion they feel the

* Acting upon a suggestion from my friend Robert Frost, the New England poet, I once counted the *O's* in *Hamlet*, which I happened to be reading with a class. They varied in length from the merest (inaudible) gasp to over one fifth of a blank verse line; and I couldn't reduce the whole number (over a hundred) into fewer than forty groups of similar meaning! Some of them naturally compelled a gesture. But I cannot guarantee to pronounce *O* by itself forty different ways! Like movements and lines, sounds get their characteristic tone from the whole of which each is a part.—G. H. B.

effects of; 3. The relation between these movements and the emotion.

1. Certain feelings have the effect of exciting nervous and muscular activity, others of depressing it. The first are expressed for the most part in movements, the second in attitudes. *E. g.*, compare the expression of good spirits, which is an exciting sentiment, with that of sadness, which is a depressant. The happy man can hardly keep still; he is all on the go; he chats vivaciously: the sad man voluntarily remains seated and silent. Active or passive, all feelings are compatible with grace, but only on condition that they are moderate enough not to stir us out of our self-possession; if they take on an excessive intensity, all grace is destroyed.

2. In some cases, the effect produced by the sentiment expressed will only serve to add to the effect produced by the movements themselves. *E. g.*, if a smile is gracious, it serves not only to animate the face, but also to awaken in the observer feelings of cheerfulness and good will analogous to those which it expresses. In other cases, there will be a conflict. The expression of physical pain is never graceful, no matter how beautiful the attitudes may be by which it is expressed, because the sympathy we feel for the suffering comes strongly to the front and dispels, by contrast, the kind of physical sympathy [empathy] which makes us take pleasure in the rhythmic play of the muscles and the ease of their contractions. Mental anxiety, however, may still allow the impression of grace to be given, as coquettes well know, because then the conflict is not so very immediate; but still the inward disturbance, if prolonged at all, must be light.

'When we see a movement executed under our very eyes,' remarks M. Guyau, 'we sympathize with the body and the limbs which execute it; but we sympathize still more with the will which moves the body and limbs; the force of that will can attract us more than the facile play of the organs; the object pursued by it can attract us more than a movement without an object; finally, there comes a time when the limbs, reduced to the role of mere instruments, stretched and bent like a bow about to shoot the arrow, sometimes broken even in their effort, count for nothing. It was no use for the messenger of Marathon, as represented in Greek sculpture, to be covered with sweat and to show in his features the very exhaustion of his strength, the beginning of agony—he had the laurel branch, which he waved above his head, to transfigure him and make him glorious. This man, broken but triumphant, is a symbol of human labor, of that supreme beauty made not of parsimony but of prodigality, not of ease but of effort,—a beauty in which the movement is no longer the sign or the measure of the force spent, but the expression of the will and the means of estimating his inner strength.' A truer thought cannot be expressed with more eloquence.

3. Finally, in expressive movements, we can admire even the quality of the expression; *i. e.*, the manner in which the body adapts itself to the emotion felt. There are some organisms, a trifle coarse, perhaps, that moderate feelings are powerless to rouse,

and that have to be shaken by violent passions to become expressive; and there are delicate organisms that respond to all the passions, and are made to quiver all over by the slightest emotion. It is therefore a veritable esthetic pleasure just to see how the most fugitive shades of sentiment are reflected in those mobile and transparent faces. Every particularly expressive movement, for the very reason that it is expressive, whatever the value of the sentiment expressed, has its own beauty, and a high one; for what it transfers to our eyes is not merely the life of matter and motion, but the life of the soul...

THE GRACE OF LINES

The grace of lines will find its only satisfactory explanation in the idea of motion, which is inseparable from the idea of line. A line by definition is a trajectory, a passage from one point to another. In considering lines from this point of view, we find ourselves on familiar ground. All that we have said of the esthetics of motion in general may be applied to the esthetics of lines. The graceful lines will be those which are traced by a movement supple, easy, and free; they must have a purpose, but they must not seem too much bent on attaining it; they must have a direction, but also a certain variety. 'This condition,' says Leon Dumont with justice, 'excludes from grace all direction in straight lines, at least when they are prolonged too far; or to speak more exactly, it excludes every prolongation of the same lines, even curved; for regularity in curved lines is no more attractive than in straight lines. It often happens that a series of curves is reckoned a single curve; and this confusion gives rise to the saying that curved lines are more susceptible of grace than straight lines.' Hence the charm of fanciful lines, accolades, braces, foliage, interlacings, and arabesques, in which, as Lamennais so aptly says, 'the eye is lost in the pursuit of a symmetry which it thinks each moment to seize, but which escapes him in a perpetual and graceful movement.'

But what is more important here, in lines as well as in movements, in general, is not so much grace as beauty. A line will be beautiful when its trajectory is justified, when the transition from one point to another is effected in a curve of least effort. Suppose it is a question of joining two vertical lines; the most esthetic curve will be the one that will allow us to pass from one to the other without abrupt changes in speed or direction, without jerks, without useless turns. On this score, then, it might be said that the straight line, being the most economical of all, ought to be the most beautiful of all. In general, I should be inclined to be of that opinion. If the serpentine is the line of grace, the straight line is the line of beauty [mechanical beauty, not esthetic]. It is the line which by its predominance will give some *style* to a simple piece of furniture as to the most imposing building. The 'marvellous curves of the Parthenon,' of which so much has been said, had for their object only to prevent the optical illusion which would have distorted the lines of the building, and to give them the appearance of perfect straightness. [See below.] The straight line is the rule, curves are the exception. They will be used only

to join, or to vary from time to time the hardness of the straight lines. Such is their function in Gothic architecture of the best epoch. [!] From the time when they were increased for mere pleasure and became dominant, as in the flamboyant Gothic, they mark a decadence in art.

But I would not abandon myself to sentimental reasons which would have us attribute to one line or the other, absolutely, a character of beauty. The esthetic value of a line cannot be estimated when it is considered only by itself; it must be viewed in the whole of which it is a part, in the object whose form it determines. A line is not beautiful in itself. It is beautiful or not, according as it is well or ill adapted to its purpose. We ought to admire it only so far as it is justified by local convenience. If, in general, curves drawn by hand or, as it is said, by sentiment, produce a more pleasing effect than those traced by a compass, it is only because they are better adapted to their particular end; are, I should willingly admit, more intelligent. A building will have good lines if all the lines indicate good construction.

And so the conclusion of this study brings us back to the essential principle which we established at first; and which we should like to see established in all discussions on art and taste; viz., that *real beauty is in the intelligent adaptation of things to their end.*"—1889.

[Real *mechanical* beauty! That's almost exactly what Spence, Winckelmann, and other XVIII Century estheticians said also of grace—"the proper relation of the acting person to the action." In the XIX Century, Schopenhauer thought grace "the perfect ease and obvious appropriateness of all the person's movements and positions;" and Emerson associated beauty and grace not only with efficiency, but also with truth, goodness, and other moral qualities. In XX Century esthetics, the word "beautiful" implies "the satisfaction derived from the contemplation not of things but of aspects; and an aspect consists of sensations grouped together into *relations* by our active, our remembering, our foreseeing perception." (V. Lee). "True or false is a judgement of existence; it refers to things; but aspects are what they are, and do not necessarily imply anything beyond their own peculiarities." ("The Beautiful," 1913, p. 19). The main fact of XX Century psychological esthetics is this: "The satisfaction or the dissatisfaction which we get from shapes is satisfaction or dissatisfaction in what are, directly or indirectly, activities of our own." (ib., p. 30). The perception of shape, therefore, "depends primarily upon movements which *we* make, and the measurements and comparisons which *we* institute." (p. 35).

In her earlier book, "Beauty and Ugliness," (1912, p. 18,) Vernon Lee makes the following quotation from the book we have been translating: "To imagine things as they are for themselves," writes M. Souriau, a most suggestive psychologist, whose esthetics would have been extraordinarily valuable if only he had added a knowledge of contemporary German thought to his own investigations on the subject, "is tantamount to imagining what they

would be if they had an obscure consciousness of their own existence. Now, we have only one way of thus imagining things from inside, and that is, to put ourselves inside them."

"We say, for instance," shē continues in a suggestive passage that is worth quoting in full, "that hills *roll* and mountains *rise*, although we know as a geological fact that what they really do is to suffer denudation above and thickening below. Also that arches *spring*, cupolas *soar*, belfries *point*, although the material buildings merely obey the laws of gravitation. Nay, we attribute movement to motionless lines and surfaces; they *move*, *spread out*, *flow*, *bend*, *twist*, etc. They do, to quote M. Souriau's ingenious formula, what we should feel ourselves doing if we were inside them. For we *are* inside them; we have 'felt ourselves,' projected our own experience, into them... This phenomenon of esthetic *Einfuehlung*, or, *Empathy*, is therefore analogous to that of moral sympathy. Just as when we 'put ourselves in the place' of a fellow-creature, we are, in fact, attributing to him the feelings we should have in similar circumstances; so, in looking at a Doric column, for instance, and its entablature, we are attributing to the lines and surfaces, to the spatial forms, those dynamic experiences which we should have were we to put our bodies into similar conditions. When we attribute to the Doric column a condition akin to our own in keeping erect and defying the force of gravitation, there is the revival in our mind of a little drama which we have experienced many millions of times, and which has become registered in our memory, even like that less common drama of hope, disappointment, and anguish which has been revived in the case of our neighbor's grief and attributed to him. When we project into the soul of our bereaved neighbor such feelings as we have ourselves experienced on similar occasions; when we interpret the forms of architecture in terms of our own muscular pressures and strains, we are in both cases, however seemingly indifferent, producing in ourselves that particular dynamical experience which we attribute to the persons we have sympathized with, to the form 'into which we have felt ourselves.' The projection of our experience into the *non-ego* involves the more or less vivid revival of that experience in ourselves; and that revival, according to its degree of vividness, is subjeet to the same accompaniment of satisfaction or dissatisfaction as the original experience. So, when this attribution of our modes of life to visible shapes and this revival of past experience is such as to be favorable to our existence and in so far pleasurable, we welcome the form thus animated by ourselves as 'beautiful'; and when all these processes of attribution and revival of our dynamic experiences are, on the contrary, unfavorable to us, we avoid that form as 'ugly'."

All this is more easily appreciated from the point of view of grace, for then we are observing not merely lines and shapes, but palpable movements. We have already seen that these "dynamic experiences," however, do not necessarily involve locomotion, voluntary or involuntary,—often they are only muscular tightenings or organic sensations (altered breathing or heart-beat, per-

haps slight movements of the eyes, etc.), mostly involuntary, and usually unconscious; but only in terms of activity like this can our "feelings" and many phases of our experience now be scientifically explained. Mere sensation can not explain esthetic feelings. Pleasurable feelings are said to be due to a congruity or co-operation of these motor tendencies; disagreeable feelings to incongruity or conflict in our natural motor responses. The impressions which make up the experience of a straight line, for instance, permit a simple adjustment, involve no inner conflict, and are therefore pleasurable; the irregularity of a broken line, on the other hand, makes us restless, disturbs us, irritates us, and therefore produces a disagreeable feeling. According to present-day esthetics, a curved line is therefore more agreeable than either, because "a regular curve has not merely unity and regularity, but a certain variety which makes the total experience richer in character than does the rigid uniformity of a straight line." The reason why the Greeks thickened the Doric column in the middle with the beautiful curved entasis was not to secure the "appearance of perfect straightness," for straightness would really intensify the esthetic impression of weakness just where the column ought to look strongest, but, by re-inforcing the supporting column at the critical point, to give the observer a pleasurable feeling of satisfaction, instead of distress and conflict, when he sees the lines and recognizes the adequacy of the column to do the work expected of it; for any feeling of inadequacy, or lack of balance or symmetry, is attended by an uncomfortable experience and by a spontaneous bodily effort to assist or to correct.

The illusions of weight, referred to by M. Souriau, are better explained by the activity of these muscular tensions. "There can be no doubt," says a XX Century psychologist, "that whenever one looks at a small object, he prepares to lift it. The preparation consists in an incipient act, and this act is the physiological parallel of an important phase of the observer's mental process of recognition,"—as of the adequacy of the column, or the perceptual estimation of the weight of a book on the desk. "The tension of the muscles often becomes so intense in watching another person at work that the observer becomes conscious of the tension as a distinct fact in experience. In looking at inanimate objects, the tension is not so great; but our perception of the column, for instance, involves an active sympathy (empathy) which is as important in determining the total character of the mental process as is the complex of sensory impressions."

My own experience in judging skating competitions is in complete accord with this; my empathetic participation in the action frequently is so intense that awkward movements or unexpected inefficiencies in the contestants almost give me physical pain; if seated, I often find myself on the very edge of my chair; if on my skates, I can hardly keep still; and sometimes I have to exert strong will, not always successfully, to keep from making some audible or active demonstration. I doubt if the winners in the Robinson Cup competition for the Pair-Skating Champion-

ship of The Skating Club of Boston got much more esthetic pleasure out of their actual performance, last March, than I did in following "empathetically" their brilliant program. In spite of the multifarious liabilities to optical illusion, to see clearly with the physical eye only the positions and movements submitted for your judgement on a particular occasion, and not, after careless, hurried, or partial observation, to see with the "mind's eye" what you have often seen before or what you expect to see; to judge fairly of the "harmonious composition," "variety," and "difficulty" of original, five-minute, free- or pair-skating programs as they fly by you for the first and only time, and have discrimination enough to differentiate the comparative grace of numerous competitors, "empathetically" or otherwise, is to subject the powers of perception of movement to one of the severest trials imaginable. Souriau's Part IV gives little aid here.

The performer as perceiver too, however, may profit by the French psychologist's observations. He has reminded us how familiarity with the laws of attitude, movement, and rhythm, and with the various methods of terrestrial, aquatic, and aerial locomotion may serve not only to improve our own methods of locomotion, but also to provide us with more stable principles of esthetic judgement. He has demonstrated that tho' the appearance of ease is a fundamental of grace, the most graceful movements are neither those that require least effort (H. Spencer) nor those that tire the least. Grace is more than mechanical beauty. To create the impression of physical ease, movements should conform to our individual habits, be made without visible effort, without noise, with apparent lightness, with a maximum of stability, and a minimum of apparent resistance; in addition, there ought to be some obvious variety in the rhythm, obvious freedom in the purpose, and a certain prodigality in the effort—too obvious economy robs movements of their grace. "It is often said that to be graceful, movements ought above all else to be natural; but the perfectly natural can be attained only with the aid of art. It is impossible that there should not be in grace a bit of coquetry; and this coquetry even gives it one more charm." For Souriau's "muscular synergy" and "putting ourselves inside things," XX Century science has substituted "kinesthesia" and "Empathy"; and the way to grace is now clearer than the average will or patience to take it.

G. H. B.]

THE PSYCHOLOGY OF GRACE*

The application of Kinesthesia (muscle-joint sense) and Empathy to the Fine Arts of Physical Self-Expression, and their Relations to Educational Psychology. Motor-Reactions and Behavior. The Testimony of the most expert Dancers, Skaters, and Swimmers in the World.

Grace is one of the easiest elements of beauty to recognize, but one of the hardest to analyze and define. Not the least of the trials of our judges of artistic skating, waltzing, and diving competitions (without any formulated standards) is the accurate and discriminating differentiation, according to regulations, of the "grace" of several contestants; and by no means the least of the problems of enthusiastic devotees of these arts is to know when they are graceful; or, when they are told that they are not graceful, to know how to train themselves into grace. Some are naturally graceful without training; some with most persistent training can never be perfectly easy and graceful; but all can im-

* *Printed in part in the Boston Transcript May 12, 1917.*

In addition to the dives illustrated in this article (from her forthcoming book, "How I Swim", thanks to Miss Kellermann), she executes the "Neck Dive," something like the "Fore-arm", only she lies on her back, swings her feet up, and "takes off" from the back of her neck; the "Dolphin," a side dive with a twist in the air; the "Wooden Soldier," a stiff topple forward, with the hands at her side; the "Front Back," reverse of the "Back Front"; the "Standing-Sitting," in which she drops from standing to sitting position and dives from the rebound; and the "Standing-Sitting-Standing," in which she drops from standing, bounds up from the sitting position and, without hitting the springboard (no easy feat), lands on top of it, and takes off, as always, from both feet.

For the photographs, we are indebted to the kindness of Mr. Mark A. Luescher, of the N. Y. Hippodrome.

prove, if they will only think it worth while to take advantage of some of the rapidly accumulating experience and information available on this subject.

Whether, with XVIII century writers on esthetics like Spence, we deem the prime quality of grace to be "propriety" (*i. e.*, appropriateness); or, with XIX century authorities like Schopenhauer, believe it to be the "perfectly adequate expression of a moving person's intention or act of will, in his movements and positions," or like Herbert Spencer, conclude that "an action is most gracefully achieved when achieved with the least expenditure of force,"—of two things we may be assured: There can be no grace without motion (or the idea of motion), and no graceful movement with much self-consciousness. "In other words," says Spencer, "grace as applied to motion, describes motion that is effected with an economy of muscular power; grace, as applied to animal forms, describes forms capable of this economy; grace, as applied to postures, describes postures that may be maintained with this economy; and grace as applied to inanimate objects, describes such as exhibit certain analogies to these attitudes and forms. The stiff branch of an oak tree standing out at right angles to the trunk, gives us a vague notion of great force expended to keep it in that position; and we call it ungraceful, under the same feeling that we call holding out an arm at right angles to the body ungraceful. Conversely, the lax drooping boughs of a weeping-willow are vaguely associated with limbs in easy attitudes—attitudes requiring little effort to maintain them; and the term graceful, by which we describe these, we apply by metaphor, to the willow."*

* This transfer of feeling is more than a figure of speech. XX century psychological-esthetics has analyzed it scientifically and given it a new name, further explained in this article; namely, Empathy, "a newly discovered element in our perception, to which," it is said, "we probably owe the bulk of whatever satisfaction we connect with the word 'beautiful' ". What we are transferring from ourselves to the willow, owing to the universal tendency to "merge the activities of the perceiving subject with the qualities of the perceived object," is not merely the thought of "limbs drooping in easy attitudes" (which at the moment is really *being done* by our own muscles, and is therefore no "vague notion"), but also the thought of "drooping in easy attitudes" in general, which has been accumulating in our minds long before we ever came into the presence of any particular willow. This complex process, then, by which we (unsuspectingly) invest a particular willow with the stored-up modes of our own (kinesthetic) activity; this process by which we make the willow "weep"; this animating the *object* of our feeling and perception into the *subject* of a verb expressing a human, personal function (though we are no more aware of doing anything with our muscles then we are aware of *doing* our digestion or circulation); this "putting the cart before the horse and attributing to the cart only what the horse can be doing" (like inverting "I measure this line by *extending* my eye from A to B" into "this line extends from A to B," or "I appreciate the way she dances, or skates, or swims," into "it *looks* easy, she is graceful," etc.), — it is this psychological process of association and "in-feeling" (far less "vague" than Herbert Spencer

"This connection between gracefulness and economy of force, will be most vividly recognized by those who skate. The requisite confidence and due command of the feet having been obtained, those twistings of the trunk and gyrations of the arms previously used to maintain the balance, are found needless; the body is allowed to follow without control the impulse given to it; the arms to swing where they will; and it is clearly felt that the graceful way of performing any evolution is the way that costs least effort."

This statement made sixty years ago, before there was any organized figure-skating in this country, and when English combined skating, which aimed at maximum of speed with minimum of effort, impressed the spectator with its extraordinary difficulty, but with stiff poker-like lack of grace, is still true in part, and true in part of the other physical arts as well. Although the subsequent evolution of the art of skating has prescribed certain positions and movements as requisite to graceful form, and although modern rules allow neither the body to "follow without control the impulses given to it," nor the arms to "swing where they will," these prescribed positions, requiring indefatigable persistence in practice, always have a specific object, and are the positions which long experience has proved to be the easiest and most conducive to correct balance and efficient execution. This so-called "school" skating is duplicated in the other arts. What the discipline of the Russian national ballet exacts for many laborious years, we know only too well from the exposition of Pavlova and Nijinski; and what school-skating and ballet-practice do to prepare for grace in skating and dancing, practice on the fundamental swimming strokes, (breast, side, over-arm, and trudgen) must do to prepare for finish and grace in artistic swimming. A swimmer like Annette Kellermann, who is making her swimming less athletic and more artistic every year (she looks back with repulsion, but not with ingratitude, to her earlier days of long distance and endurance competitions), has to do as much training as an athlete to keep her figure to the right proportions and her muscles hard but supple. With expert instructors, she does ballet-practice an hour and a half to two hours, and skates an hour or more, every day, and takes singing lessons besides! "In my work on the stage and for the screen," she says, "I depend on no one part of the body, but on all parts relatively to the whole. *The beauty of movement depends on the success of its muscular economy.* In diving, the grace of movement lasts from beginning to end, when, *e. g.*, the line formed by the body completes itself in the air and the body enters the water without a splash—then it is a finished performance. And finish is the test of swimming as an art."

thought) which constitutes Empathy, the "sense" by which we appreciate beauty and grace, and by which we realize that all grace is beautiful, but not all beauty graceful. Cf. Vernon Lee, "Beauty and Ugliness" 1912, "The Beautiful" 1913, Theodor Lipps, "Zur Einfuehlung" 1913 E. B. Titchener, "Psychology of Thought Processes" 1909, etc. Also H. S. Langfeld, "Mind and Muscle in Golf," Century Mag., December, 1913.



FINISH IS THE TEST OF SWIMMING AS AN ART.

Thanks to the Hippodrome management, an unusual opportunity was offered, during the recent visit of Boston skaters to New York, to discuss these questions with the greatest experts in the world. On the mornings of the competition days, on the huge stage which all the early season had presented Pavlowa's dance-drama of "The Sleeping Beauty," there were gathered some of the best amateur skaters in the United States, several of the best professional skaters in the world, including Bror Meyer, of St. Moritz, the unique Charlotte, and Annette Kellermann "herself;" and they all talked freely of their art. Before considering, however, just how these experts know when they are graceful,—and it has generally been found that those who have the best control of their muscles can give the least adequate account of how they succeed—let me briefly describe Miss Kellermann's extraordinary aquatic performance.

Through a high rocky gorge, a boisterous cascade tumbles into a line of big glass tanks, in which mermaids are playing, diving, and swimming through coral rings, etc. One can hardly doubt that "This way the water until his sophisticated the motion-picture rip-stage gurgle, and the dozen winged fairies the stage. Suddenly, the "Queen of the Mermaids" slides off the cliff into the deepest tank, turns whirling somersaults forward and backward, her lithe body curved backward almost into a complete hoop, and then sways to and fro in most fascinating undulations and oscillations,—all under water. "It is a curious and most interesting fact," says Miss Kellermann, "that swimming is the only exercise in the world in which the human body is perfectly and completely suspended in a foreign element. There is no weight for the legs to lift or the arms to sustain." In a recent New York Art Magazine (The Soil, March 1917) appeared this pretended advertisement:

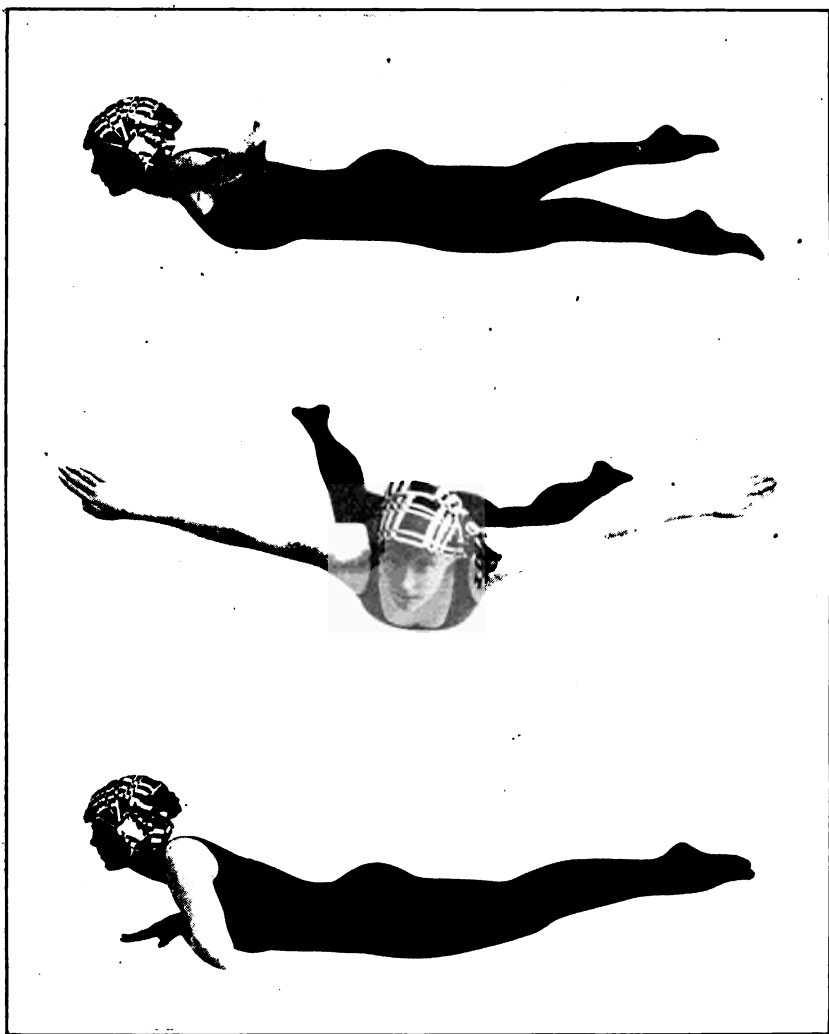
"EXHIBITION of *The Freedom of Movement in Light and Space*. Aquarium, Battery Park, etc."

But here you have a more beautiful exhibition of the same thing, because intelligent and therefore even more graceful.

"Perhaps," remarked Miss Kellermann, "this suspension of the body in water may account for the fact that swimming produces the smoothest and least knotted muscles known to the world of athletics."



SWALLOW DIVE



THE BREAST STROKE IN THE CRYSTAL TANK

Sometimes I have thought that we who swim a great deal may take on some of the graceful rounded lines of all the other creatures that swim well, from trout to tarpon." The freedom of movement in swimming is as much greater than in skating, as the freedom of movement on long glides and spirals in skating is freer than in dancing. "The straight dive from great heights," said Miss Kellermann after one of the skating competitions, "is almost equaled by the long poised dive forward on skates. In fact, the latter has some spectacular advantages. It lasts longer and is in some respects more difficult. The Greek runner or the Russian dancer, poised for a second, is not a more beautiful picture than Miss Weld poised on a great swooping inside edge spiral with upraised hands and extended fingers."

The perfect suspension of the body allows very slow and deliberate motions. Since grace forbids visible (ugly) kicking of the legs, and since there is here no opportunity for the trudgen stroke (brought from So. Africa by J. Trudgen, 1873) or the crawl stroke (from Australia by R. Cavill, 1902), Miss Kellermann, for artistic purposes has restored the breast-stroke, which, perhaps, has been justly discredited for speed purposes, to a higher position than it

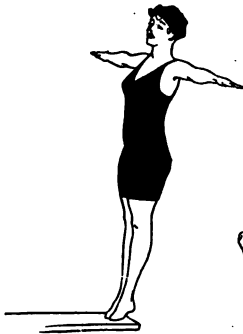
ever has had. 90 per cent of Australians swim. To a born Australian like Miss Kellermann, taught by such masters of perfect strokes as Fred Lane and Percy Cavill, it therefore seems strange that there are so few good swimmers among American girls. Only four, out of the best sixty which she picked for the screen from

three hundred, proved, when they got to Jamaica, to have had any sound training in the fundamental strokes; and it took her eight weeks to teach those "mermaids" to swim without the use of their legs! But the training was a good diaphragm and breast developer — so essential for In this kind of swimming, kicks, except to rise from the push of one foot. Her due to the development of ing.

feature of Miss Kellermann's form and finish, is her quick

under-water swimming. Miss Kellermann seldom bottom with a gentle unique control is largely her abdominal breath-

The most noticeable diving, after its perfect recovery to perform some underwater evolution. Most divers have to come up to the surface immediately; her mermaids, to stay down, all have to wear lead belts; but her control of her breathing is so complete, that she can stay at the bottom, or stop half-way up, or at any glass panel, at will, simply by exhaling air. "I could stay under water twenty-four hours and be perfectly comfortable—



BACK DIVE



if I had breath. The experience of complete relaxation, of being perfectly sustained in a soft, yielding, pleasant element like water, has a psychological effect that may account for the acknowledged great physical benefits of swimming."

Miss Kellermann's selection of eight or ten dives from her big repertory is made not because they are most spectacular, but because they lend themselves best to recovery for underwater movements, can be executed with the utmost finish, and therefore are not likely to put extra strain upon the glass by any possible splash, etc. There are only 6 feet 10 inches of water in a 9x15 foot tank, and her last dive is 18 feet high! These dives, however, are not "stunts." "I hate the spectacular," she says; "finish of performance is what gives elegance to any feat of this nature."

Between dives come the most original and fascinating features of the demonstration. The side whirl or "rolling log," the horizontal coil or flat somersault (impossible in the air), the reversed pendulum (head down and feet up), and other unique underwater movements, which ordinarily never could be seen in natural waters, even if

attempted, display a body trained to perfect submission to the will,—which is the essence of grace. When asked how she could open her mouth under water and apparently converse with the flirting clown without choking, she replied, "With my

hands tied behind my back, I never could have got out of the swirling waters in Jamaica alive, if it hadn't been for my life-long ballet-practice; and now my singing lessons enable me to lock my throat, so that I don't even take any water into my mouth. Everything helps!"

In these days, when so much is being made of the theory that all knowledge or physical, is special and from one subject to another, to note that J. Graham won the Amateur billiard Great Britain over Sidney up in the British amateur agrees with Nathan Hall, of new United States amateur that the billiard "touch" is of

and skill, intellectual non-transferable it is significant also Symes, who has just championship of Fry, a former runner-golf-championship, Malden, Mass., the billiard champion,

great aid on the putting green; and that the keenness of eye and calculation required to master delicate billiard shots is of great assistance in gauging approach shots. The Jap professional, Yamada, believes that golf, in turn, helps billiards.

There are other details of Miss Kellermann's exhibition of the



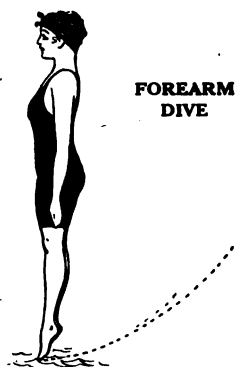
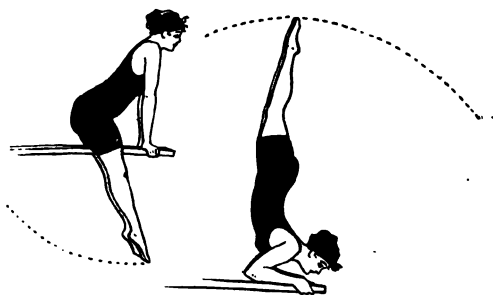
BACK-FRONT DIVE



subjection of the moving human body to the will that I might dwell upon, if my vocabulary were adequate even to my imperfect memory. As we follow with equal admiration the equally remarkable physical demonstration of Charlotte and her skating-companions in the ice-ballet which succeeds, and reflect that this more than robust, vigorous, and shapely girl was a sickly child, who took up skating for her health; and that Annette Kellermann was a cripple, terribly afraid of the water, until forced to take up swimming as a last resort—"It was not until I was thirteen years old that my legs were perfectly straight," she says. "I was compelled to wear high shoes until I was eighteen, and to this I attribute my small ankles"—when we reflect on these paradoxes, we have an increased respect for such physical arts as doers as well as beautifiers, even though "beauty is its own excuse for being."

"The things I do seem to come naturally," says Miss Kellermann, "as a result of my health and vigor; probably, too, as a result of my build. I know I have been called a perfect woman as to shape," she added, "and compared to the Venus de Milo! It is ridiculous, because they judge from a pose. The nude seems always to be a question of posed attitudes, with all their suggestiveness. I appear practically nude on the screen, yet in this respect I think my work is natural and healthy. I should not have attempted it otherwise. I hate to pose. You can take a hundred or two hundred women of the same or nearly the same measurements, and pose them all at once in the same attitude, and they might all look alike; but ask them to do the same thing, and the differences will suddenly appear very marked—one will be a deeper breather, another will have a firmer step, another a clumsier carriage, etc. I don't like the legs of Greek Venuses—they are beef down to the heels. The modern woman is developed along slimmer lines, her legs taper down to the ankles. The charm of Greek women lay in their expression of repose, of calm—whether they were more beautiful than we, is, of course, another question—but the body of today is more aggressive; it is slender; its beauty lies in shape that expresses motion, that can do things."

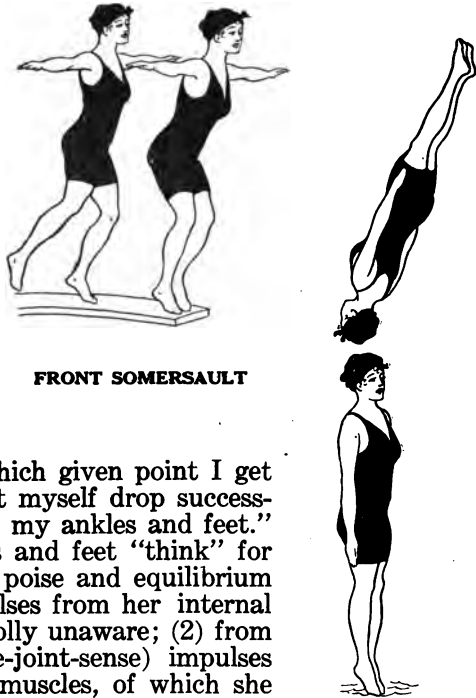
Here she speaks like an up-to-date educational psychologist. In fact, without knowing it, both in theory and in practice, she is



FOREARM
DIVE

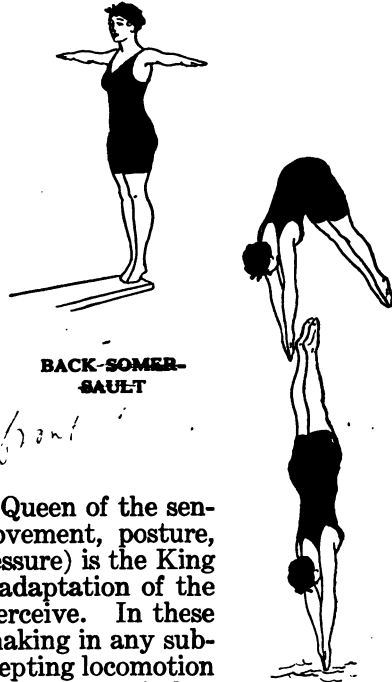
in harmony with the latest psychology, which interprets the reactions from all the situations of life's experience in terms of "behaviour," *i. e.*, in motor-reactions; and the curriculum in schools is being readjusted on this basis of motor-activity and sense-training—from the Montessori and play-schools, through industrial and trade schools, to such socializing experiments as are beginning this fall in the General Education Board's big new school at Teachers' College, N. Y. (Flexner), inspired by theory, and the little new school at Dayton, Ohio (Morgan), inspired by fruitful experience. The solution of our question of grace, therefore, is more likely to come from the experimental psychologists than from the authorities on old-fashioned esthetics.

When I first asked Miss Kellermann if she always knew when her movements were graceful, she replied, "Of course." "Where do you know it?" "In my head, I suppose, where I know other things." Later, in explaining how she could modify her pace and levitation under water, rising or stopping at will, she said she knew perfectly just where she was going to stop, but didn't know how or where she knew. Unconsciously she let the secret out in explaining her diving: "Poise is the thing I most strive for in diving, or indeed in any part of my work. By poise I mean not only the general carriage of the body, but its particular movement in carrying out the act. When I dive, *e. g.* I always look up in the air, my arms out and my head up, and I always know at which moment I am poised just right, at which given point I get the right equilibrium to let myself drop successfully; the rest is done with my ankles and feet." In other words, her ankles and feet "think" for her. Her sense of perfect poise and equilibrium comes (1) from nerve impulses from her internal organs, of which she is wholly unaware; (2) from similar kinesthetic (muscle-joint-sense) impulses from her joint and trunk muscles, of which she is sub-conscious; and (3) from conscious sensations from her skin, especially from the soles of her bare feet, where the highly differentiated nerve-endings are sense-organs of the most refined active touch. Of what fine kinesthetic adjustments the human body is capable, no other illustration is more significant than the miraculous skill of an Ole Bull, or a Helen Keller, or any of the less famous congenitally blind.



FRONT SOMERSAULT

Observe her use of vision. When Herr Meyer says that the prosperity of most of his figures on the ice depends upon the way he is looking, I suspect he is confounding two things: vision for orientation, and his inherent kinesthetic control. "It is an established psychological fact that a strong tendency to movement accompanies every mental act," says Prof. Langfeld of Harvard, writing on "Mind and Muscle in Golf." "To think of turning to the right, *e. g.*, is involuntarily to start the muscles in that direction." The turning of the eyes in a skating figure, however, may produce a co-operative movement of head and shoulders which will facilitate a continuous skating movement, but spoil a golf-stroke. As a matter of fact, after Meyer has got the "feel," he can do the mere figure as well without vision, if not better. Numerous researches in the psychological laboratories of the United States have shown that animals can execute complex movements without vision, hearing, smell, or feelers (*vibrissae*) just as well as with them; in some cases, even better—by kinesthesia alone. Why can't men? "It is not that the intellectual man brings too much mind into the game," says the Harvard psychologist, "but rather too little muscle." Herr Meyer seems to make two mistakes: (1) in not acknowledging, as Miss Kellermann does, the muscular tonus of the whole adjustment and the kinesthetic impulses from particular receptors; and (2) in believing that kinesthesia is an inferior sense to vision, and depends upon mental or visual images. If Vision is the Queen of the senses, Kinesthesia (the sense of movement, posture, weight, shape, adjustment, and pressure) is the King of them all, underlying all in the adaptation of the sense organs to that which they perceive. In these later days, no greater progress is making in any subject of human knowledge—not excepting locomotion on land, in the air, on, in, or under water, wireless electricity, operative surgery, or preventive medicine, than in our knowledge of these kinesthetic sense-organs and the integration and adjustment of their impulses by the central nervous system. Instead of five sense, we have nearer twenty-five described in the latest text-books on neurology; and a new popular series of ten volumes, "Our Senses and What they Mean to us," each by a specialist, is announced, under the general editorship of Dr. George V. N. Dearborn, who writes the volume on "Kinesthesia." Our senses certainly mean everything to us in this discussion concerning grace.



The problem, then, reduces itself to a recognition and adaptation of kinesthetic impulses from these innumerable, omnipresent, microscopic sensory end-organs, which are stimulated to activity by the normal contraction of the muscles, stretching of the tendons, and bending of the joints, and which report to the central nervous system the exact degree of pressure, tension, flexion, etc. The upper layer of the cortex of the brain acts as a kind of "central" at a switch-board of ten billion wires (neurones) in a miracle of integration and adjustment, combining, by a continuous stream of inhibitory control, these kinesthetic impulses and those from the organs of tactile sensibility in the skin (which give us sensations of heat, cold, pleasure, pain, etc.) into one co-operative motion-unit. For example, while sitting engrossed in talking, you feel a draught on the back of your neck; you wonder if the window is open behind you; still talking, you turn round to look. You do not simply turn your head on your neck as a pivot; but instantly almost every muscle in your body contributes to a slight movement of the whole body from top to toe.

So, in learning to be graceful in any of these physical arts, we must strive to co-ordinate the movements of the separate members into one co-operative unit. Vision and memory will be necessary at first. We have to begin by imitating a model or following directions consciously. Now, if we can substitute for a mental moving-picture of "ourselves as others see us," an actual pattern, or path, or pose, manipulated perhaps by a kindly hand behind our back; and gradually learn to know, without assistance, just when the position or movement is right, by the "feel" and by the result, as Miss Kellermann does—then we are on a scientific and sure road to grace. A mirror's or a critic's assurance is of great assistance; but the practice should be concentrated as soon as possible on acquiring the "feel." Natural dancers, skaters, or swimmers are those endowed with a high degree of muscular co-ordination; and these can and do dispense with the purely mental and visual factors unusually early; but dispense with them everyone must, before he can be graceful.

Grace, according to Spencer's theory, might be attributed to any perfectly ordered machine. Economy of effort, however, is not the only law of grace. To be artistic, not merely mechanical, there must be given an impression of reserve force, even of prodigality, of freedom and variety of movement and rhythm. To give the impression of physical ease, movements must be made in conformity with the individual's natural habits, and without any visible effort, (hence the white faces of clowns and mimes) or audible noise; also with the appearance of lightness, stability, and the least possible resistance. A performer may really exert great force, or may be acting under physical pain or mental anguish, and yet give the impression of enjoyment, charm, and grace. The spectator, however, must have sufficient experience with the technique of the art to be able to "feel himself in" all the movements, so as to be able to judge of the difficulties overcome if he would judge fairly. As a matter of fact, he cannot escape from his own

parallel kinesthetic reactions. According to the new psychological esthetics, when he says a person is graceful, he is really "merging his own kinesthetic activities in the qualities of the object," meaning thereby that, if he were performing himself, such and such movements would be easy and satisfying and therefore graceful, or vice versa. To this irresistible "in-feeling" (*Einfuehlung*, Lipps, 1897), Prof. Titchener (1909) has given the new name *Empathy*—not a projection of self into the object, because you are thinking, not of yourself, but of the object; and not sympathy, because, though analogous, it is not a mere inner mimicry (*Innere Nachahmung*, Gross, 1902), but an objectifying of that mimicry (*Miterleben*). Sympathy is subjective—you make the feelings of the other your own; the ease, reserve, and harmony, however, which you ascribe to a dancer or a skater or a swimmer, are really the "empathetic" ease and harmony in your own muscles, though the dancer or skater or swimmer may actually have very different kinesthetic reactions. "If Empathy is so recently discovered, this may be due to its being part and parcel of our thinking; so that we are surprised to learn of its existence, as Moliere's good man was to learn that he talked prose," or Newton that the acorn fell according to a law of gravitation.

To be truly graceful, then, as Souriau hinted thirty years ago, we must watch our kinesthetic impulses, if not to compel positively graceful movements, at least to avoid awkward and affected ones; for grace, Schiller said, is a beauty not bestowed by nature, but produced by the subject himself. Undoubtedly this presupposes some natural gifts: a body supple, agile, vigorous; a figure not unattractive; an instinctive sentiment for rhythm and harmony, etc. All the rest is our work, the product of our own activity. Yet the effort, the training, the preliminary discipline, must be eliminated from the graceful act. The natural is the essential condition of grace; the more we seek grace, the faster it flies; and the less we concern ourselves consciously with our movements, the more real, spontaneous grace they will have.

When we contemplate what the Russian Ballet might be as a fine art of physical self-expression if it would only select less gross and sensual emotions to express; and what the Berlin ice-ballet might be in the hands of skaters like Herr and Fräulein Mueller with a company of skilled amateurs like the best of the Skating Club of Boston, in elaborations of their tentative Ice-Idyls, with all the accessories of scenery, lights, and music of the Russian Ballet,—we realize that these fine arts of physical self-expression are even yet only in their infancy. The physical limitations of the size and strength of plate glass, and the physical necessity of rising to the surface at least once a minute for breath; handicap artistic swimmers in vying with artistic skaters or dancers in the development of this ocular opera, and force them to resort to the screen. If the photo-play is, as the poet Vachel Lindsay would have us believe, sculpture-in-motion, painting-in-motion, and architecture-in-motion; if, according to the late Prof. Muensterberg, the ideal photo-play is a new art form, then perhaps Miss Keller-

mann may find in the waters of the ocean and in the photo-play of the future, a field worthy of her artistic ability. A school-boy in a theme on "The Movies" wrote the other day, "To long films, like "The Daughter of the Gods," some go to find grace, others for different reasons." The commercial management cater to those "reasons," and abuse the art accordingly. That is no reason, however, why an author of genius, who is familiar with the resources of the motion-picture and is able to express "those things which are deepest and highest in the modern mind and which at the same time are capable of emerging in picture-writing form," might not produce a water-drama which, in Miss Kellermann's hands would be a thing of beauty and a joy forever. As it is, however, the graceful evolutions of "herself" alone in the tank, though less of a drama, are more of a fine art than the films.

